

Pesticide poisoning,
deliberate self-harm
and
suicide in the
Sundarban Region
of
West Bengal, India

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Dekan

I dedicate this thesis to my loving parents

পথের দেবতা প্রসন্ন হাসিয়া বলেন-

দিন রাত্রি পার হয়ে, জন্ম মরণ পার হয়ে, মাস, বর্ষ, মহাস্তর পার হয়ে চলে যায়...
তোমাদের মর্মের জীবন-স্বপ্ন শেওলা-ছাতার দলে ভরে আসে, পথ আমার তখনও ফুরোয়
না... চলে... চলে... চলে... এগিয়েই চলে

The Lord of Life smiled and said:

Day merges into night and night transforms into another day. . . . the
saga of birth and death continues. . . . months and years come and
go; decades pass by too. . . . your cold, empty world is filled with
evergreen, moss-like dreams. . . .
Yet, my long journey never ceases, it just goes on and on and on. . . .

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Summary

Suicidal behaviour, which encompasses non-fatal deliberate self-harm (DSH) and suicides, are serious public health problems in many countries of the world. In 2002, an estimated 873,000 people died by suicide, which represents 1.5% of global mortalities and together with non-fatal deliberate self-harm (DSH), intentional self-injury comprises 1.4% of the global disease burden. Approximately 86.0% of the global suicides occur in low-and middle-income countries particularly with pesticides.

Community mental health research in the Sundarban region of India previously identified widespread concerns about DSH and suicide, mainly because of pesticide ingestion and the lack of effective treatment to prevent avoidable mortality. Acknowledging the problem and responding to the requests from the community, a programme for preventing suicidal behaviour that combined research, clinical services, and community intervention was developed for the Sundarban region with a special focus on Namkhana Island.

To document the burden of DSH and suicide in clinical facilities, a retrospective (1999-2000) clinical epidemiological research was carried out in 6 island hospitals, commonly referred to as Block Primary Health Centres or BPHCs. A total of 1,277 DSH patients were admitted to the 6 island-hospitals from 1 January, 1999 to 31 December, 2001. Among them, 78.0% of the patients survived their attempt, 12.0% died and for 10.0% the outcome was not recorded. Women accounted for 78.0% of the DSH admissions and 67.0% of the deaths. Pesticides were the most commonly used agent for DSH (88%). The Case Fatality Rates (CFR) of self-harm reported in these hospitals ranged from 6.0% to 50.0% (mean 17.7% \pm 16.3). The age group 45-54 years was at highest risk of death from DSH and younger patients in the 15 - 24 year age group were at lowest risk, indicated both by crude and adjusted analyses. The higher lethality of DSH from pesticide ingestion compared with other methods was suggestive but, not significant.

A clinical cultural epidemiological study (2001-2003) was conducted among 40 DSH patients admitted to the Dwariknagar BPHC of Namkhana block. Cultural epidemiology, a discipline integrating anthropological orientations and epidemiological methods, was used to identify the locally valid perceptions of DSH. The EMIC (explanatory model interview catalogue) is a tool of cultural epidemiology. It is a semi-structured interview schedule and was administered among 40 DSH patients admitted to the Dwariknagar BPHC of Namkhana block to collect both quantitative and qualitative information

and to understand the synergistic relationship between triggers, underlying problems of DSH, individual perceptions of these problems and help seeking for these problems prior to the DSH attempt. Women constituted 67.5% of the study sample. Majority of the patients had secondary education (47.5%) were married (67.5%). Household work (47.5%) was the main occupation reported. Quarrel (40.0%) and social, interpersonal conflicts (95.0%) were the most frequently reported triggers and perceived causes respectively. More than half (57.5%) the patients had not sought any help for the problem that provoked the DSH event.

A community cross-sectional study was conducted among 1,680 households in 21 villages of Namkhana to identify agriculture-related pesticide practice, DSH and suicide in the community and the interactions between pesticides and self-harm. Of the 1680 households surveyed, 72.7% reported using pesticides for agricultural purposes and 50.4% of these households stored pesticides at home. There were reports of 181 incidents of suicidal behaviour over a period of five years. Conflict with family members was the most frequently reported reason for suicidal behaviour. The kappa statistic indicated poor agreement between respondents and investigator about safe storage of pesticides. The overall annual rate for DSH was 256.0 per 100,000 persons (95% CI 215.0-302.4) and for suicide it was 84.7 per 100,000 persons (95% CI 61.8-113.2). The pesticide-related annual DSH and suicide rates were 158.1 (95% CI 126.2-195.5) and 73.4 (95% CI 52.2-100.3) per 100,000 population respectively.

Along with the activities mentioned above an intervention was ongoing to identify community perceptions about the problems leading to DSH and suicide as well as local concepts and ideas to guide strategies for interventions to prevent DSH and suicide in general and with pesticides in particular. Five important issues that emerged from this study are: the importance of facilitated focus group discussions (FFGDs), a modification of the traditional focus group discussions whereby the discussions were facilitated by introducing the topic with a questionnaire, the mutual economic dependency of the farmer and the pesticide shop-owner on pesticides, the absence of regulation and supervision of pesticide sale in Namkhana Island and widespread unsafe pesticide practice leading to accidental, occupational and intentional poisoning mainly as a result of lack of knowledge and the need to address the contexts in which DSH and suicide occur.

This thesis clarified the epidemiology of DSH and suicide coming to medical attention, the extent of the problem in the community, the typical context and situations in which DSH and suicide occur and the importance of community participation in promoting public health. Findings indicated

that DSH and suicide is not the result of a single factor, but the interaction of a host of factors. Female gender roles contributed to the vulnerability of women to DSH and suicide. Psychosocial stressors such as domestic violence, verbal or physical abuse, easy availability of pesticides of self-harm during stressful moments, lack of access to treatment all contributed to DSH and suicide in the region.

This research recommends the development of an intersectoral programme linking the interests of the agriculture department, local administrative bodies, the health sector and the community at large. This conjoint approach - by promoting awareness about safe pesticide practice, developing alternative methods of pesticide use, sensitising and encouraging community supports to those vulnerable to DSH and suicide and improving medical management of pesticide poisoning - would help to reduce morbidity and mortality due to pesticide-related DSH and suicide in not only Namkhana but also in similar settings in India and the world.

Zusammenfassung

Suizidales Verhalten, das nichttödliches Selbstschädigendes Verhalten und Suizide umfasst, muss als ein ernstes Problem des öffentlichen Gesundheitswesens in vielen Ländern der Welt angesehen werden. 2002 starben geschätzte 873.000 Menschen durch Suizid, was 1.5% der globalen Mortalität ausmacht. Zusammen mit nichttödlichem Selbstschädigenden Verhalten umfasst absichtliche Selbstverletzung 1.4% der globalen Krankheitsbelastung (burden of disease). Circa 86.0% der globalen Suizide geschehen in niedrig- und mittleren-Einkommensländern, insbesondere durch Schädlingsbekämpfungsmittel (Pestizide).

In einer vorhergehenden Studie über die allgemeine Situation psychischer Gesundheit in den Gemeinden der Sundarban Region in Indien betonten die Bewohner selbst Ihre Besorgnis über suizidales Verhalten, besonders in Bezug auf die Einnahme von Pestiziden und das Fehlen von effektiven Behandlungen bei solchen Vergiftungen. Auf die Anfrage der Gemeinden hin, wurde ein Suizidpräventionsprogramm, das Forschung, klinische Dienste und Interventionen kombinierte, für die Sundarban Region mit einem speziellen Fokus auf das Namkhana Gebiet entwickelt.

Um die Belastung von suizidalem Verhalten in Krankenhäusern zu dokumentieren, wurde eine retrospektive (1999-2000), klinisch epidemiologische Forschung in 6 Inselkrankenhäusern durchgeführt, allgemein bezeichnet als Block-Primärgesundheitszentren oder BPHCs. 1.277 suizidale Patienten wurden in die 6 Insel-Krankenhäuser aufgenommen vom 1. Januar 1999 bis zum 31. Dezember 2001. Unter ihnen überlebten 78.0% der Patienten ihren Suizidversuch, gestorben sind 12.0% und bei 10.0% ist der Ausgang nicht notiert worden. 78.0% Frauen wurden aufgenommen und 67.0% davon starben. Vergiftung durch Pestizide war die Hauptmethode des suizidalen Verhaltens (88.0%). Die Fall Todes-Rate (case fatality rate) des suizidalen Verhaltens in diesen Krankenhäusern reichte von 6.0% bis 50.0%. (Mittelwert: $17.7\% \pm 16.3$). Die Altersgruppe der 45-54 Jährigen hatte das höchste Mortalitätsrisiko als Folge des Selbstschädigenden Verhaltens. Jüngere Patienten (Altergruppe 15-24) hatten ein geringeres Risiko. Eine höhere Letalität von Selbstschädigendem Verhalten durch Pestizide im Vergleich mit anderen Methoden war nahe liegend, jedoch statistisch nicht signifikant.

Eine kultur-epidemiologische Studie (2001-2003) wurde unter 40 Patienten durchgeführt, die aufgrund von Selbstschädigendem Verhalten in die Dwariknagar Block-Primärgesundheitszentren des Namkhana Inseln aufgenommen wurden. Kulturelle Epidemiologie, eine neuere Disziplin, die anthropologische Ansätze mit epidemiologischen Methoden kombiniert, wurden verwendet, um die

lokalen Perspektiven von suizidalem Verhalten zu erkennen. Der EMIC (explanatory model interview catalogue), ein halb-strukturierter Interviewfragebogen wurde 40 suizidalen Patienten administriert, die in das Dwariknagar BPHC des Namkhana Inseln aufgenommen wurden, um Auslöser, zu Grunde liegende Probleme, und Hilfesuchendes Verhalten in Bezug zu dem Suizidversuch zu identifizieren. 67.5% der Patienten waren Frauen. Die Mehrheit hatte eine Sekundärbildung (47.5%) und war verheiratet (67.5%). Haupttätigkeit war Hausfrauendasein (47.5%). Die am häufigsten berichteten Auslöser und wahrgenommenen Hauptursachen waren Streit (40.0%) und soziale und zwischenmenschliche Konflikte (95.0%). Mehr als die Hälfte der Patienten (57.5%) hatte keine Hilfe für das Problem gesucht, das dem Suizidversuch vorausging.

Eine Querschnittsstudie wurde in 1.680 Haushalten in drei Dörfern Namkhanas durchgeführt, um ein Bild von dem Gebrauch und der Handhabung von Pestiziden, von suizidalem Verhalten und der Interaktionen von beiden zu bekommen. Von den 1.680 Haushalten, die begutachtet wurden, verwendeten 72.7% Pestizide für die Landwirtschaft und 50.4% dieser Haushalte bewahrten diese Pestizide zu Hause auf. Es gab Berichte von 181 suizidalen Geschehnissen über eine Zeitdauer von 5 Jahren. Streit mit Ehepartnern war der am häufigsten berichtete Grund für Selbstschädigendes Verhalten. Die Kappa Statistik zeigte ein schlechtes Übereinstimmen zwischen Befragten und dem Befrager in Bezug zu der sicheren Aufbewahrung von Pestiziden. Die jährliche Gesamtrate für suizidalem Verhalten war 256.0/100.000 personen (95%CI 215.0-302.4), beziehungsweise 84.7/100.000 personen (95%CI 61.6-113.2). Die jährliche Rate der durch Pestizid verursachten Selbstschädigenden Verhaltens lag bei 158.1/100.000 personen (CI 126.2-195.5) und für Suizid bei 73.4/100.000 personen (95%CI 52.2-100.3).

Zusammen mit den verschiedenen Studien der Bestandsaufnahme über suizidales Verhalten verursacht durch Pestizide, fand auch ein Interventionsprogramm statt. Dieses Programm hatte zum Ziel, Wahrnehmungen der Menschen über Probleme, sowie über die lokale Konzepte und Idee, die zu suizidalem Verhalten führen, zu erkennen, um damit zukünftige Suizidinterventionsprogramme effektiver zu planen. Folgende fünf, wichtige Resultate ergaben sich aus dieser Studie: die Bedeutung von moderierten Fokusgruppen-Diskussionen, eine Modifikation der traditionellen Fokusgruppen-Diskussionen, in denen die Diskussionen mit einem Fragebogen eingeleitet wurden; die gegenseitige wirtschaftliche Anhängigkeit der Landwirte und der Pestizid-Laden-Besitzer in Bezug auf die Pestizide; das Fehlen einer Steuerung und Supervision des Pestizid-Verkaufs im Namkhana Block und der weit verbreitete, ungeschützte Pestizid-Gebrauch, der zu Unfällen, Berufsunfällen und beabsichtigter

Vergiftung führt, überwiegend aufgrund von mangelndem Wissen und der Notwendigkeit Selbstschädigendes Verhalten und Suizide zu thematisieren.

Diese Forschungsarbeit verdeutlichte das Vorkommen von Selbstschädigendem Verhalten und Suizid, das in den offiziell medizinisch diagnostiziert wird; das Ausmass dieses Problems in den betroffenen Gemeinschaft; der spezifische Kontext und die Situationen in den Selbstschädigendes Verhalten und Suizid auftreten; und die Bedeutung des Einsatzes der Gemeinschaft im Bereich der öffentlichen Gesundheit. Resultate zeigten, das Selbstschädigendes Verhalten und Suizid nicht Folge eines einzigen Faktors sind, sondern multi-faktoriell bedingt sind. Psychosoziale Stressoren wie häusliche Gewalt, verbaler und physischer Missbrauch, leichter Zugang zu Pestiziden während stressreicher Momente und fehlender Zugang zu adäquater Behandlung: all das trug bei zu Selbstschädigendem Verhalten und Suiziden im Forschungsgebiet.

Diese Studie empfiehlt die Entwicklung eines übergeordneten Programms, das die Interessen des Landwirtschaftsministeriums, lokaler administrativer Organe, des Gesundheitssektors und der Gemeinschaft verbindet. Dieser integrative Ansatz – in der Förderung des Bewusstseins über geschützten Pestizid-Gebrauch, alternativen Methoden des Pestizid-Gebrauchs, Sensibilisierung und Ermutigung jener Menschen, die verletzlich sind hinsichtlich Selbstschädigenden Verhaltens und Suizid und die Verbesserung der medizinischen Versorgung des Pestizid-Vergiftung - würde dazu beitragen, die Morbidität und Mortalität als Folge von Pestizid-Assoziiertem Selbstschädigendem Verhalten und Suizid zu verringern, nicht nur in Namkhana, sondern auch in vergleichbaren Regionen in Indien und weltweit.

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List of Abbreviations

ANC	Arabinda Narayan Chowdhury
&	And
BDO	Block Development Office
BMOH	Block Medical Officer of Health
BPHC	Block Primary Health Centre
CDBs	Community Development Blocks
CDC	Centre for Disease Control and Prevention
CFR	Case Fatality Rates
CH	Conföderatio Helvetica (Switzerland)
CI	Confidence Interval
Cum %	Cumulative Percentage
DDT	Dichloro-Diphenyl-Trichloroethane
Dept	Department
DSH	Deliberate Self-harm
Eg	Example
EMIC	Explanatory Model Interview Catalogue
EURO	Europeaan Union Regional Office
F	Female
FGD	Focus Group Discussion
FFGD	Facilitated Focus Group Discussion
Fig	Figure
Freq	Frequency
Govt.	Government
GP	Gram Panchayat
≥	Greater than equal to
HCP	Health Care Providers
Hrs	Hours
HS	Help-seeking
ICMR	Indian Council of Medical Research
IEC	Information, Education and Communication
IOP	Institute of Psychiatry
IPM	Integrated Pest Management

KPS	Krishi Prayukti Sahayak
M	Male
MGW	Mitchell G. Weiss
MO	Medical Officers
N	Number
NCRB	National Crime Records Bureau
OM	Operational Model
OR	Odds ratio
P	Probability
PAM	Pyridine Aldoxime Methiodide
PC	Perceived Causes
%	Percentage
PHC	Primary Health Centre
PR	Participatory Research
Prof	Professor
Pvt	Private
Rs	Rupees
SB	Sohini Banerjee
SD	Standard Deviation
Sp	Spontaneous
STI	Swiss Tropical Institute
SUPRE-MISS	Suicide Prevention - Multisite Intervention Study on Suicide
T	Total
UNEP	United Nations Environment Programme
UP	Underlying Problems
USA	United States of America
US\$	United States Dollar
Viz	Namely
WHO	World Health Organisation

Chapter 1

Introduction

Pesticide poisoning, deliberate self-harm and suicide in the Sundarban Region of West Bengal, India

Introduction

Intentional-self injury is a serious public health problem in many countries of the world. In 2002, an estimated 873,000 people died by suicide, which represented 1.5% of global mortalities and together with non-fatal deliberate self-harm (DSH), intentional self-injury comprised 1.4% of the global disease burden (WHO, 2004). Approximately 86.0% of the global suicides occur in low-and middle-income countries (Krug *et al.*, 2002), particularly with pesticides (Jeyaratnam, 1990; Eddleston *et al.*, 1998; Eddleston, 2000; Eddleston *et al.*, 2002; Gunnell & Eddleston, 2003; Eddleston & Phillips, 2004). Although pesticides account for majority of the intentional self-injury in low-and middle-income agrarian communities, suicidal behaviour using pesticides receives relatively little international attention (Konradsen *et al.*, 2005). Further consideration and resources are required for research to support innovative public health action to control this problem (Bertolote *et al.*, 2006b).

Even though, intentional self-injury is an individual act, it has considerable emotional and economic ramifications on families, friends and the communities of affected persons (Konradsen *et al.*, 2006). Preventive measures would save premature loss of human life and resources (Desapriya *et al.*, 2004). Thus, the need to develop effective intervention strategies to reduce morbidity and mortality from DSH and suicide, particularly with pesticides, motivates this research.

Concepts of suicide and deliberate self-harm

While, the term suicide (derived from the Latin words 'sui' (of oneself) and 'caedes' (to kill) can be traced as early 1642 in *Religio Medici* by Sir Thomas Brown (Minois, 1999), the concept of deliberate self-harm (DSH), is a recent formulation. Before the 1950s, little distinction was made between people who killed themselves and those who attempted to do so. Erwin Stengel, a psychiatrist, made one of the earliest efforts to distinguish between the two populations viz., people who died by suicide and those who survived comparable suicidal behaviour (Stengel, 1958). This differentiation was further emphasised by Kreitman and his colleagues (1969), who introduced the term 'parasuicide' to refer to less lethal, non-fatal acts with the intention to die. Morgan coined the term deliberate self-harm (DSH) in 1979. More recently Keith Hawton (2002), distinguished fatal versus non-fatal self-harm on the basis of outcome rather than intention.

This thesis proceeds from Hawton's definition of DSH mainly, that it refers to an act of non-fatal DSH, without attempting to judge the lethality of intent in applying the term.

Approaches to studying suicide

Historically two main schools of thought have dominated suicide research, one sociological, concerned with sociodemographic patterns of risk, and the other psychological, emphasising individual psychopathology. For centuries, the phenomenon of suicide was viewed as an individual act explained with reference to moral and theological concepts until the beginning of the 20th century, which marked a shift in the focus of analysis from religions and moral to a more scientific orientation.

A book by the French sociologist, Emile Durkheim (1858 - 1917), "Le suicide: Etude de sociologie" (1951) was the first serious effort to establish an empirical approach to study of suicide in sociology. It offered a sociological explanation for a phenomenon previously regarded as exclusively psychological and individualistic. He was concerned with both the social analysis and classification of suicides. Durkheim's classification identified four types of suicide, viz., altruistic (excessive integration with the society); egoistic (inadequate integration with the society); anomic (sudden changes in individual societal position) and fatalistic suicides (inadequate and excessive societal regulation). His works lead to the development of two unique methodological approaches for studying suicide, viz., sociological and epidemiological. Stack (2000) reviewed a decade and a half of sociological studies of suicide that continue to develop the Durkheimian school of thought, examining cultural and economic factors, and questions of social integration.

While Durkheim pioneered the sociological approach to suicide research, Sigmund Freud (1856-1939) established a psychological theory of suicide. He emphasised the role of individual psychopathology and psychodynamics in his doctrine that postulated a death instinct or *thanatos* (1920). Karl Menninger (1938) elaborated the Freudian theory and as an alternative to Durkheim's emphasis on the macrosocial forces, he stressed the role of psychology to explain suicide.

There has been a shift in suicide research from earlier concerns with psychodynamic forces and processes to the present focus on high-risk disorders, particularly psychiatric disorders (alcohol and substance abuse, depression, personality disorders and schizophrenia). This change shifts the psychiatric focus from ego functions and coping skills and reflects an emphasis on nosology in psychiatry. Although, suicide is not a disease per se, nevertheless a vast body of suicide literature is concerned with the association between suicide and both psychiatric disorders and biological factors, including the role of genetics, neurotransmitters (serotonin), depression etc., rather than psycho-social and behavioural dimensions of DSH. In recent decades, suicide is a "multi dimensional malaise" (Shneidman, 1985), which is not a result of a single factor but, has been regarded as a conglomeration

of behavioural, biological, cultural, psychological and social factors (Mann, 2002).

Establishment of the field of suicidology by Edwin Shneidman, who also coined the term, was based on recognition that an interdisciplinary framework was required to understand suicidal behaviour and derive practical benefits. Like Engel, the proponent of the biopsychosocial model in medicine (Engel, 1977), Shneidman emphasised the significance of a comprehensive approach, but, eschewed reductionist formulations that explained the phenomenon, essentially as an outcome of depression and other disorders, a product of psychodynamics, or a concomitant result of social status or biochemical markers. He argued that suicide is essentially a result of intense emotional pain and suffering, which he called *psychache* (Shneidman, 2001). His focus on suicidal behaviour arising from the emotional impact of social-interpersonal processes takes into consideration cultural values and situational stressors, which have been widely represented in popular literature though largely neglected in professional research (Wassenaar *et al.*, 1998; Bhatia *et al.*, 2000).

Cultural epidemiology is a discipline that integrates anthropological orientations and epidemiological methods to examine locally valid representations of health problems. Anthropological interests include the impact of culture on illness burden with reference to its social and cultural context. Epidemiological interests include measures of illness burden and analysis of sociocultural risk factors and outcome measures. This approach examines the nature of illness and the distribution of variables accounting for its distinctive experience (patterns of distress), meanings (perceived causes) and associated risk-related and health-seeking behaviour-both across and within cultures (Weiss, 2001). When applied to DSH and suicide, study interests focus on underlying problems, their causes and trigger events that motivate DSH, and the experience and meaning of the act of self-injury. Help-seeking interests are concerned with the underlying problem(s) that precede the DSH event. The complementary relationship between basic epidemiology and cultural epidemiology, has guided our study, which, is summarised in table 1 (STI Biennial Report 2003-2004).

Table 1.1: Complementary orientations to epidemiology of suicidal behaviour

Orientation	Basic Epidemiology (DSH and suicide)	Psychiatric Epidemiology	Cultural Epidemiology
Focus	Morbidity and mortality	Psychiatric disorders	Patient-identified problems and settings of suicidal behaviour
Basic Science	Suicidology	Psychopathology and nosology	Medical anthropology and sociology
Specified burden	DSH (nearly lethal and other)	Psychiatric disorders	Problem-specific experience meaning and behaviour
Application	Clinical and population based prevention	Psychiatric treatment and indicated treatment	Empathetic clinical treatment; rethinking settings for selective prevention

Global patterns of suicide and DSH

Suicide is a considerable but largely preventable public health problem, causing more than half (53.9%) of all violent deaths estimated for the year 2002. Globally, more people died by suicide, than from all homicides (34.5%) and wars (10.6%) combined (WHO, 2004) which, approximately represents more than 20,000,000 disability-adjusted life-years (i.e. years of healthy life lost through premature disability or death) (WHO, 2003). The highest annual rates are reported from Eastern Europe, where 10 countries report more than 27 suicides per 100,000 persons. Latin-America and Islamic countries are reported to have lowest rates, fewer than 6.5 per 100,000 (WHO, 2005). In United States of America (USA), in 2002, suicide accounted for 31,655 deaths- a rate of 11.0 per 100,000 population per year, attempted suicide rate of 0.6% and suicide ideation rate of 3.3% (Kessler *et al.*, 2005) representing a huge human tragedy and an estimated \$11.8 billion in lost income (Mann *et al.*, 2005).

Over the past four and half decades, death due to suicide has increased by about 60.0%. Based on extrapolations from current trends, the World Health Organisation (WHO) estimates that approximately 15,300,000 people will die by suicide in the year 2020, and 10-20 times more people will engage in DSH globally. On average, this represents one death every 20 seconds and one attempt every 1-2 seconds (Bertolote & Fleischmann, 2002).

The highest suicide rates for both men and women are found in Europe, especially Eastern

Europe (WHO/EURO, 2002). Globally, suicide is not distributed evenly in the population. There is a clear tendency of suicide rates to increase with age. Although suicide rates can be between 6-8 times higher among the elderly, as compared to young people, globally, in terms of absolute numbers, more young people are dying from suicide. Most suicides are committed between 35-44 years and there has been an increase in suicide among young adults (15-44 years) (WHO, 1999).

In his article Khan (2002) points out that more than 10.0% of the world's suicides occur in India, Sri Lanka and Pakistan which is more than 100,000 deaths. He also recommends that studies on suicide should consider culture-specific risk factors linked to suicide.

There is considerable international variation as well as consistencies in suicide data. The epidemiology and trends in suicide differ considerably between Asian and Western countries. Studies indicate that the male-female ratio for suicide in Asia is smaller than that in the West, especially in China where the reversal of male-female ratio has been noticed since the last decade (WHO, 1999).

There is very little published research on DSH. The WHO Regional Office for Europe in Copenhagen initiated a collaborative multicentre study on DSH in 16 catchment areas in Europe. DSH data from 16 European countries between 1989-1992 showed that lifetime prevalence of DSH in clinical set ups were estimated at about 3.0% for women and 2.0% for men. This study showed a decrease of 17.0% and 14.0% on average of male and female DSH rates respectively. The trends in DSH rates over the four years of monitoring were different for each centre. In most centres, there were also years with increases in rates (Schmidtke *et al.*, 1996; Kerkhof, 2000). Recent estimates in UK suggest a DSH rate of about 400 per 100,000 population in a year (University of York, 1998).

In 1999 the WHO launched the Suicide Prevention- Multisite Intervention Study on Suicide (SUPRE-MISS) which examined suicidal behaviour in a number of countries. Eight low-and middle-income countries viz., Brazil, China, Estonia, India, Iran, South Africa, Sri Lanka, and Vietnam along with two additional sites from Australia and Sweden participated in this study. The study included appraisal of treatment strategies for suicide attempters, a community survey of suicidal ideation and behaviour, the analysis of biological parameters including DNA analysis on an optional basis (in countries where it is legally permitted) and a community description aimed at assessing basic socio-cultural indices. Individual studies have reported findings on the community survey of suicidal thoughts and behaviour. Published data on the community survey on thoughts, plans and suicide attempts including basic socio-cultural indices indicated that suicide ideation, plans and attempts varied by a factor of 10-14 across sites. The ratios between thoughts, plans and attempts varied considerably

within study sites. The range of those who sought medical attention after an attempt was as wide as 22.0% to 88.0%. The study concluded that culture influenced the process of thoughts, plans and attempts of suicide; the burden of unnoticed attempted suicides was high in different cultures and urged the health sector be more responsive in identifying and be supportive of such individuals (Bertolote *et al.*, 2005). As a part of the SUPRE-MISS, studies conducted in Australia, Brazil and Vietnam report findings on suicidal ideation and behaviour in the community.

The community survey in Australia was conducted among 11, 572 residents of Queensland. Results indicate that suicidal thoughts and attempts existed in the age group 25-44 years and declined with increasing age. Knowledge about someone else's suicidal behaviour increased the risk of similar acts. The ratio of completed to attempted suicide was 1 to 23 (De Leo *et al.*, 2006).

The study from Brazil was conducted among 515 individuals above the age of 14 years. Suicidal ideation was present in approximately 17.0% of the study population, nearly 5.0% made plans and about 3.0% attempted suicide. Women, young adults (20-39), those living alone and suffering from mental disorders were particularly prone to suicidal thoughts (Botega *et al.*, 2005).

The study from Vietnam was conducted among 2,280 randomly selected residents of Hanoi. Prevalence rates of suicidal ideation, plans and attempts were approximately 9.0%, 1.0% and 0.5% respectively. Suicidal thoughts were associated with negative psychosocial risk factors, lifestyle and emotional problems (Thanh *et al.*, 2005). All three studies have recommended that risk factors of suicide be taken into consideration while planning a suicide prevention programme.

To assess the prevalence of suicide ideation and attempts, a study was conducted among 40,000 subjects aged 15-54 years in nine countries (USA, Canada, Puerto Rico, France, West Germany, Lebanon, Taiwan, Korea and New Zealand) during the 1980s and the 1990s. This study found approximately 3.0%-5.0% of the study population has made a suicide attempt some time in their life (Weissman *et al.*, 1999).

Welch (2001) attempted a world literature review on epidemiology of DSH, which he termed as parasuicide (suicide attempts and deliberate self-harm inflicted with no intent to die), in the general population from the studies reported in the English literature between 1970-2000. He found parasuicide is a serious public health problem and the annual rates in recent decades ranged from 2.6 to 542 per 100,000 population in registration studies (samples of medically treated people). One-year incidence rates from population surveys ranged from 700 to 1,100 per 100,000 people and lifetime prevalence rate ranged from 720 to 5,930 per 100,000 persons. The most important risk factors identified were

younger age and female gender.

DSH, as has been mentioned earlier, occurs more frequently as compared to suicide. However, there continues to be a dearth of published research on the topic. There is clearly a need for more DSH studies in order to estimate the extent of the problem at a global level.

Quality of data of suicide and DSH

Global figures on suicide should be interpreted with a certain degree of caution because suicide data is not available from all nations across the world. Most of the data is available from industrialised countries. Data from some Asian countries contribute to global suicide data-bank, but little information is available from Africa and South America. While only 21 countries reported suicide data in 1950, in 1995 suicide data is provided by 105 member countries to the WHO (WHO, 1999).

Available suicide data are very likely to be an underestimation of the real picture. Factors like inadequate reporting, social stigma, and legal implications make it challenging to accurately estimate real rates of suicide (Bertolote *et al.*, 2006b). These factors make it far more difficult to specify the actual number of individuals involved in acts of DSH, which some studies suggest may range from 10 to 40 times more than completed suicides (WHO/EURO, 2002). Problems with data for DSH are even more vexing than data for suicide. Although regional studies on DSH and suicide may reflect more accurate information, nevertheless, the data underscores global trends which are noteworthy.

Global, national and local research on DSH and suicide are limited in their approach in the sense that they continue to be concerned primarily with the socio-demographics of the phenomenon, rather than its underlying causes, underlying factors precipitating the self-harm attempt.

Suicide and DSH in India

In India over 100,000 persons commit suicide every year. India, which includes approximately 17.0% of the world's population contributes to about 10.0% of suicides in the world (Vijaykumar, 2004). In India, information on suicide at the national level is provided by the National Crime Records Bureau (NCRB), Ministry of Home Affairs, Government of India. The Bureau compiles information from all the states and union territories and publishes annual reports. More recently, this data is also available electronically from the NCRB website (Government. of India, 2002). With inadequacies in reporting and notification, analysis, compilation and dissemination of suicide data, the precise magnitude of the problem in the country remains unclear. Moreover, the Bureau collects data from police stations and

not from health centres. Not all cases of suicide are reported to the police. This may contribute to further underestimation of the problem. While the bureau provides information on suicide, it does not maintain any records on DSH. This partial information provides an incomplete picture of the entire spectrum of the problem underestimating its extent.

Suicide is among the top ten causes of death in India and among the top three causes of death among those between 16 and 35 years (Government of India, 2002). Reported national suicide rates rose from estimated 6.3 in 1980 to 8.9 per 100,000 people in 1990 (Government of India, 2002). The national suicide rate for 2001 was 10.6 per 100,000 population (Government of India, 2002), a 14.5% increase from 1991 to 2001. There are considerable regional differences in the suicide data. The socioeconomically advanced state of Kerala has the third highest suicide rate in India (30.1 per 100,000 people in 2001), and the conflict areas of Jammu and Kashmir which were taken together ranked 32nd, with a rate of 1.5 per 100,000 population in 2001. Such differences may reveal more about the ability of local institutions to collect these data than real differences in suicide rates (Weiss & Parker, 1995).

Apart from data provided by the NCRB, different regional rates have been reported in the literature. Regional suicide studies with active case findings in India, conducted during different time periods have found rates as 29.0 per 100,000 people in Jhansi (Shukla *et al.*, 1990); 95.2 per 100,000 people in rural Tamil Nadu (Joseph *et al.*, 2003) 152 per 100,000 for young women (10-19 years) and 69 per 100,000 for young men in Southern India (Aaron *et al.*, 2004). In a study in Bangalore city, Gururaj & Isaac (2001) found that during 1989-1999 the suicide rate had increased from 10 to 35 per 100,000 persons and the incidence of DSH was estimated to be 250 per 100,000 persons per year. Young adults in the age group of 20-24 years accounted for the highest number of suicides (27.0%) followed by 15-19 years (20.0%). The male to female ratio was 1.2:1. The mean age of attempted suicides among men and women was 28 and 25 years respectively. They found family conflict was the major cause of attempted suicides (37.0%) and organophosphorous poisoning was the most common method (54.0%) of DSH.

India differs from Euro-American countries with respect to the sex and age distribution of suicides. Although male suicides predominate, the ratio of males to females in India for suicide is 1.3:1 (Government of India, 2002). Like China, the low male-to-female sex ratio in India raises questions about gender and vulnerability of women to suicide.

Other studies of DSH have been reported by Adityanjee (1986); Latha *et al.*, (1994); Latha

et al., (1996); Sharma, (1998); Narang *et al.*, (2000) and Singh *et al.*, (2000).

Studies such as these indicate the importance of regional suicide research that provides in-depth insight into the problem, which the data at the national level fails to reflect.

Suicide and DSH in West Bengal

The suicide data for the entire state of West Bengal is collected by the Kolkata police and compiled by the Crime Records Bureau, which in turn sends the information to NCRB. Among the 28 states and 7 union territories in India, the state of West Bengal ranks 11th, with a suicide rate of 17.1 per 100,000 persons (Government of India, 2002). This rate is considerably higher than the national average of 10.6 (Government of India, 2002). It is difficult to ascertain whether such high numbers reflect good data collection and record keeping, or a true difference from the national average. A study with active case finding, however, suggests official data are underestimates. Banerjee *et al.*, (1990) reported a rate of 43.4 per 100,000 in a cluster of villages in West Bengal. Other published studies on self-harm in West Bengal include Chowdhury *et al.*, (2001) and Chowdhury *et al.*, (2003).

Global role of Pesticides

According to Bertolote and colleagues (2006a) deliberate pesticide poisoning accounts for about a third of all suicides worldwide. Gunnell & Eddleston (2003) estimated that 300,000 (over 60.0%) of pesticide-related suicides occur each year in China and Southeast Asia.

Other studies on self-harm suggest pesticides account for more than 90.0% of suicides in Malaysia (Maniam, 1988); 71.0% in Sri Lanka (Somasundaram & Rajadurai, 1995) and 68.0% in Trinidad (Hutchinson *et al.*, 1999). Studies in other low-and middle-income agrarian countries like Bangladesh (Yusuf *et al.*, 2000); Brazil (Pires *et al.*, 2005), Costa Rica (Leveridge, 1998); India (Srinivas Rao *et al.*, 2005), Iran (Moghadamnia & Abdollahi, 2002), Jordan (Abdullat *et al.*, 2006), Korea (Shin *et al.*, 1998), Nepal (Karki *et al.*, 2001), Pakistan (Suliman *et al.*, 2006), Portugal (Teixeira *et al.*, 2004), Srilanka (Hettiarachchi & Kodithuwakku, 1989), Surinam (Graafsma *et al.*, 2006), Taiwan (Yang *et al.*, 1996), Turkey (Kalkan *et al.*, 2003) and Zimbabwe (Tagwireyi *et al.*, 2006) also found high rates of intentional pesticide-related morbidity and mortality.

Many of the most toxic pesticides have either been banned or restricted since the 1960s in most industrialised countries. However, they continue to be used extensively in low-and middle-income countries, especially in those countries where agriculture is the primary occupation. While

these pesticides were intended to enhance agricultural output and prevent vector-borne diseases such as malaria and dengue, they also cause serious problems. Some of the ill-effects of pesticide use include environmental pollution, unintentional poisoning, accidental and occupational; and intentional poisoning, which may be fatal.

Pesticides and suicide in India

Information on pesticide related suicide is available from the NCRB. Pesticides were the second most frequent method for suicide, used in 20.0% of the suicidal deaths. (Government of India, 2002). However, it does not provide any information on DSH by pesticide. Some studies from India have reported on the issue (Mohanty *et al.*, 2004; Chugh *et al.*, 1998; Siwach & Gupta, 1995). It is acknowledged that DSH is more frequent than suicide but, lack of information underrates the problem and there is a clear need to conduct studies on both DSH and suicide in order to estimate the magnitude of suicidal behaviour.

Studies from various parts of India also highlighted the role of pesticides especially organophosphorous compounds in suicide (Siwach & Gupta, 1995; Singh *et al.*, 1997; Sharma, 1998; Sureshkumar, 1998; Sing *et al.*, 1999; Narang *et al.*, 2000; Batra *et al.*, 2003; Bawskar & Joshi 2005; Srinivas Rao *et al.*, 2005; Gargi *et al.*, 2006).

Aaron and colleagues (2006) report a suicide rate of 82.2 per 100,000 population in a community based study conducted in Southern India where pesticides are reported to be one of the most preferred method of suicide.

However, epidemiological data on poisoning is not available for India. Further, there is no published data on non-fatal poisoning (Gautami *et al.*, 2001).

Pesticide and suicide in West Bengal

There is no local organisation that provides information on exposure to accidental, deliberate or occupational pesticide poisoning in West Bengal. A study conducted in 1979 by Nandi and colleagues reports suicide rates of 28.6 and 5.1 per 100,000 population in two villages of the state respectively. The corresponding national and state level suicide rates were 7.8 and 15.9 per 100,000 people respectively (Nandi *et al.*, 1979). Although, the study aimed to examine the correlation between suicide and the availability of a lethal pesticide, however, it failed to establish the hypothesis. This study also highlighted the differences in the incidence of suicide within the state and in the country. A study

conducted by Dalal (2002) found pesticides accounted for 32.6% of the 129 suicides in rural West Bengal, the most common method, followed by hanging (24.8%). Other studies (Bose *et al.*, 1999; Chowdhury *et al.*, 2001; Chowdhury *et al.*, 2003) have reported on this matter.

Suicide Prevention and Public Health

In view of the enormity of mortality and morbidity related with suicidal behaviour, especially with deliberate pesticide poisoning, suicide prevention should be a major focus of public health in the low-and middle-income countries (Vijayakumar, 2002; Phillips, 2004; Vijayakumar, 2004). Given the complexity of factors involved in suicide, it is likely that no single prevention strategy will combat this critical problem. Rather a comprehensive and integrated joint effort involving many sectors – the individual, family, agrochemical industry, community, agriculture and health care system, media is needed (Desapriya *et al.*, 2004). An inter-sectoral global public health initiative is proposed by Bertolote and colleagues (2006b) inclusive of pesticide regulation, epidemiological surveillance, medical management of poisoning, training on safe use of pesticide and development of community educative programmes to minimise risk of intentional or unintentional pesticide poisoning. Community based suicide prevention (Motohashi *et al.*, 2004) is an approach being recommended by experts in the field with a detailed focus on psychosocial stressors (Phillips *et al.*, 2002; McElroy, 2004; Sinclair & Green, 2005) and pesticide education programme (Roberts *et al.*, 2003).

Research Setting Rationale

During the course of developing and implementing a community mental health programme in the Sundarban region of West Bengal, India, the local community expressed concerns about intentional self-injury, particularly with pesticides. Hence, a comprehensive approach to DSH and suicide prevention programme for the region was developed responding to the requests from the community that included research, clinical service and a community intervention.

Study site

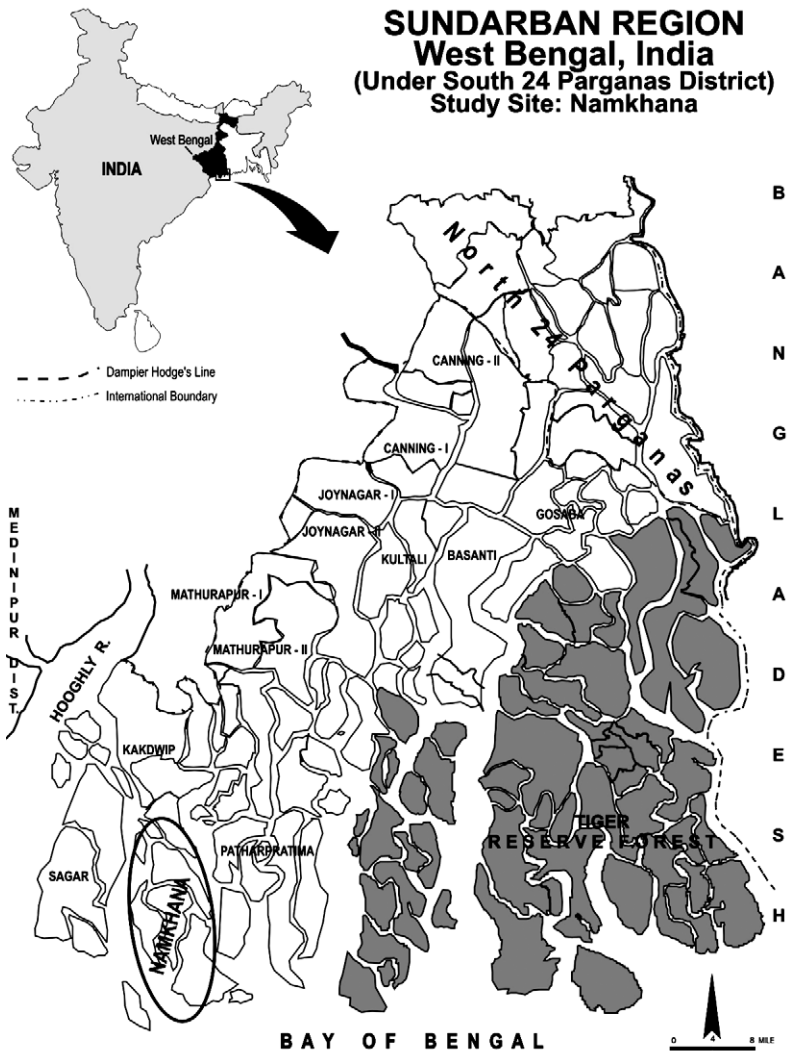
Literally meaning 'beautiful forest', the Sundarban region derives its name from the 'Sundari' (*Heritiera fomes*) trees. The region comprises both island and mainland community development blocks (CDBs) which is the lowest administrative unit of a district in the rural region. All blocks have a definite geographical boundary and a population from about 150,000 to 200,000. Straddling India

(approximately 40.0%) and Bangladesh, it is the world's largest mangrove swamp and delta formed by the sediments deposited by the three river systems Ganga, Brahmaputra and Meghna (Naskar, 1998). The Indian part of the Sundarban region lies at the southernmost part of the state of West Bengal.

Namkhana Island, one of the CDBs, situated in the western part of Sundarban region at the southern most tip of the state of West Bengal was selected as the study site (Fig.1.1). It is situated 105 kms south of the state capital, Kolkata (formerly Calcutta), and covers an area of 227 square kilometres. The total population of Namkhana is 160,627 (Census, 2001). Seven Gram Panchayats (GPs), or local self-government organisations govern 34 villages of Namkhana block. Two rivers, the Hatania-Doania and Chinai, trisect the region into three distinct geographical units. Many of these villages have no access to clean drinking water, electricity or paved roads. They are connected by mud or brick roads, which become inaccessible during the rainy season. Buses and light vehicles ply on the paved road, but people are often compelled to walk many miles since public transportation to interior villages is lacking (Chowdhury *et al.*, 2001).

There are two types of health care facilities existing in Namkhana, designated government facilities and private services. The largest government health facility in Namkhana is referred to as Block Primary Health Centre (BPHC) and there are four primary health centres or PHCs. While the BPHCs can admit patients, the PHCs have outdoor facilities only. However, for practical purposes the BPHC provides health services to the people because there are no doctors in the PHCs. There are no designated specialised health facilities and this area lacks mental health services requiring people with serious mental illness to seek help from local providers who lack specialty training or from distant cities. Among the private practitioners, very few registered medical doctors and a large number of local health care providers (locally referred to as "quack" doctors) provide health care services to the population of the region. Villagers use the term descriptively without derogatory judgement.

Agriculture is the primary source of livelihood for the people of this region (Banerjee, 1998). Decreasing cultivable land, as a result of erosion, salinity, sandy soil, weather hazards (cyclones, tides), destruction of crops by pests have all contributed to the poor agricultural yield (Bandyopadhyay, 1997). Farmers use large quantities of fertiliser, pesticide and insecticide with the hope of increasing agricultural yield. The easy availability pesticides, lethal chemicals in most households result in accidental poisoning among children and intentional self-harm in adults (Chowdhury *et al.*, 2003).



Objectives

The main objective of the studies presented in this thesis was to clarify the extent and to explain the contexts and causes of DSH and suicide particularly by pesticide ingestion in the Sundarban region, West Bengal, India with a special focus on Namkhana Island. The rationale for this study was that the community had expressed concerns about DSH and suicide, but, epidemiological data was lacking. The research was formulated to guide a community mental health programme in which suicide prevention was a recognised community priority. Specific aims and objectives examined aspects of DSH, suicide and pesticide poisoning in the region. These studies are presented in each of the following chapters:

Chapter 2: Deliberate self-harm and suicide by pesticide ingestion in the Sundarban region, India.

Research reported in this chapter examined clinical records of self-harm from 1999-2001 in six island blocks of the Sundarban region. This study clarified the clinical epidemiology, including case fatality rates (CFR) and determinants of DSH and suicide with pesticides coming to medical attention. Findings highlight the varying but considerable burden of DSH, particularly with pesticides, high CFRs and the poor quality of DSH and suicide data in the health centres. The findings indicate a need for continuous and systematic DSH and suicide surveillance in the region.

Chapter 3: Patient-reported reasons for deliberate self-harm - study from a Sundarban health centre, India.

Aiming to comprehend patient perspective of triggers of the DSH event, underlying problems, perceived causes, and help seeking related to the underlying problems leading to DSH, this research used the cultural epidemiological approach to conduct EMIC interviews among DSH patients admitted to a health centre in the Sundarban region. The narrative accounts and qualitative data help to identify the situations that lead to self-harm thereby providing useful insight to self-harm prevention for the region.

Chapter 4: Household survey of pesticide practice, deliberate self-harm and suicide in the Sundarban region of West Bengal, India.

This study proposed to estimate the magnitude of DSH and suicides and elucidate on

issues relating to pesticide practice in the Namkhana Island of the Sundarban region. A cross-sectional household survey was conducted in 21 villages of Namkhana CDB to examine household reports of pesticide practices and use of pesticides and other methods for suicidal behaviour in the community. The survey also assessed accidental poisoning, and the level of awareness among farmers about the safety, storage and ill-effects of pesticide use. This community household survey made an attempt to look beyond merely rates and diagnosis of DSH and suicide and highlights the need for intersectoral programmes that combine activities to minimise pesticide hazard and addresses the typical contexts in which DSH and suicide occur.

Chapter 5: Intersectoral community actions for preventing pesticide-related deliberate self-harm and suicide in the Sundarban region, India.

The objective of this study was to identify community perceptions about the problems leading to DSH and suicide. Identification of local concepts and ideas that could guide suitable methods for community interventions to prevent DSH and suicide in general and with pesticides in particular were sought. We aimed to acquire experience with the ideas for community action for suicide prevention and mental health promotion. Based on findings, we formulated and began testing a strategy for community action.

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Chapter 2

Deliberate self-harm and suicide by pesticide ingestion in the Sundarban region, India

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Summary

Intentional self injury, including non-fatal deliberate self-harm (DSH) and suicides with pesticides is a serious health problem in many low-and middle-income agricultural countries. The Sundarban region of West Bengal, India, is an agrarian area where pesticides are frequently used for cultivation and for self-harm. This study examined the clinical epidemiology, including case fatality rates (CFR) and determinants of self-harm in 6 islands of the region. Clinical records of DSH from 1999-2001 were examined for 1,277 DSH patients admitted to these 6 island-hospitals. Among them, 77.7% of the patients survived their attempt, 11.9% died and for 10.4% the outcome was not recorded. Women accounted for 65.2% of the DSH admissions and 67.1% of the deaths. Pesticides were the most commonly used means for DSH (88.7%). The CFR of self-harm reported in these hospitals ranged from 6.0% to 50.0% (mean \pm sd, 13.3% \pm 15.0). Crude and adjusted analyses identified determinants of mortality for DSH admissions. The age group 45-54 years was at highest risk of death from DSH and younger patients (15-24) years were at lowest risk. The higher lethality of DSH from pesticide ingestion compared with other methods was suggestive but not significant. CFR within the region was variable and high compared to industrialised nations. Case records and management of DSH were poor. An effective DSH prevention programme in the Sundarban region requires a better DSH surveillance system at clinical facilities and an intersectoral approach, linking the agricultural interests of pesticide safety and mental health interests for preventing DSH.

Key words: DSH, island, mental health, pesticide, suicide, Sundarban

Introduction

Non-fatal deliberate self-harm (DSH) and suicides, particularly with pesticides are serious global health problems in many low-and middle-income countries (Gunnell & Eddleston 2003; Eddleston & Phillips, 2004). The inter-relationship of agricultural pesticide use, DSH and suicide with pesticides have been reported from different regions of India (Bose *et al.* 1999; Gautami *et al.* 2001; Mohanty *et al.* 2004; Fleischmann *et al.* 2005; Srinivas *et al.* 2005). Pesticides contribute substantially to health and development, in as much as they boost production in the agricultural sector. They also promote public health by limiting the spread of certain vector-borne diseases (van der Hoek *et al.* 1998). However, these agents also have deleterious effects on health and environment.

To limit their adverse impact, many of the most toxic pesticides, such as Aldrin and DDT (Dichloro-Diphenyl-Trichloroethane), have either been banned or restricted since the 1960s in most industrialised nations, but they continue to be used extensively in low-and middle-income agricultural countries (ICMR, 2001). Illiteracy, financial constraints, governmental policies and limited access to safer alternatives often compel farmers in these countries to rely on very toxic chemicals (Bhanti *et al.* 2004; Mansour, 2004). Ill-effects include toxic residues of agricultural pesticides on foodstuffs and environmental pollution (Pimentel, 1996). Serious hazards of pesticide use and misuse include accidental, deliberate and occupational poisoning.

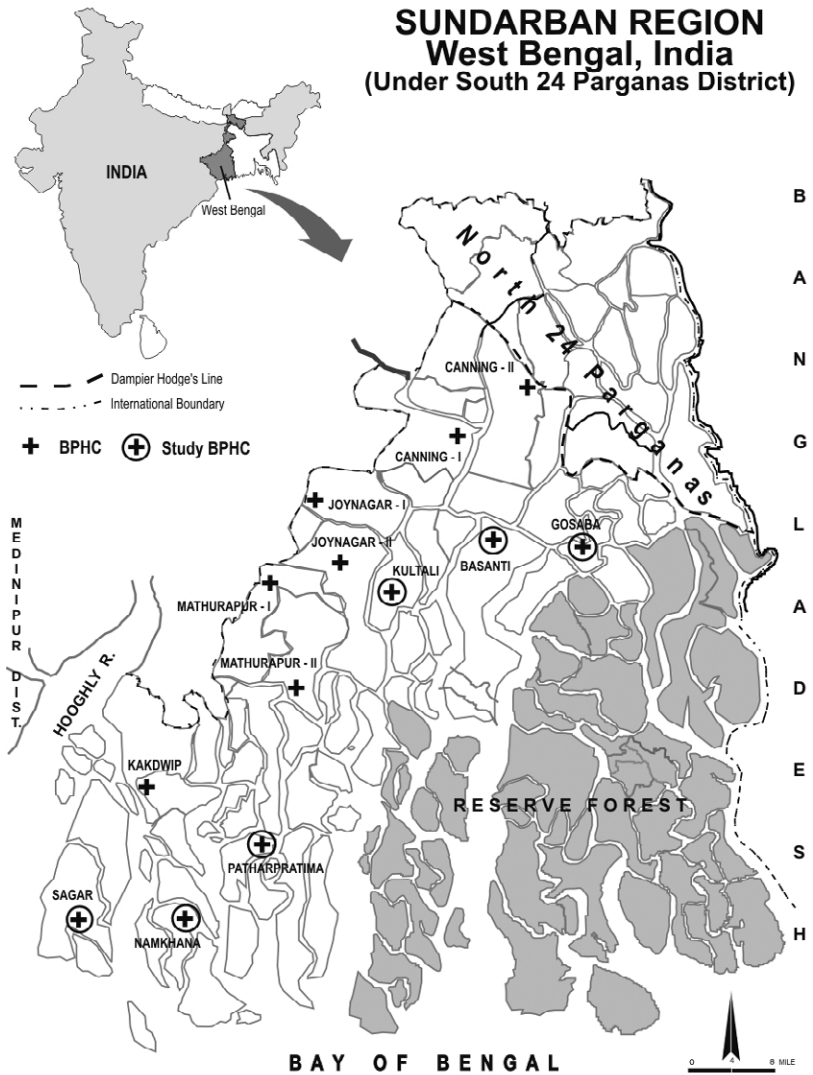
An estimated 3,000,000 people are hospitalised for pesticide poisoning each year throughout the world, resulting in 7.3% mortality among them (Jeyaratnam, 1990). Most of this morbidity and mortality is due to intentional self-poisoning. Due to lack of a uniform global surveillance system, however, there are no precise data for occupational, accidental or deliberate self-poisoning (Konradsen *et al.* 2005). Although more than 85.0% of the 815,000 global suicides in 2000 occurred in low-and middle-income countries (Peden *et al.* 2002), reports and documentation of the epidemiology of DSH and suicide from more remote rural communities, like those of the Sundarban region in West Bengal, India, are for the most part unavailable.

The Sundarban region, 40.0% in India and the rest in Bangladesh, is the largest delta in the world. The Indian portion, located at the southernmost tip of the state of West Bengal, covers an area of 9,630 sq. km. It is an underdeveloped region comprising both island and mainland community development blocks (CDBs), which are the lowest-level administrative unit of a district in this rural region. These blocks have a population between 150,000 to 200,000. Characteristic features of the region (e.g., geographical remoteness, low agricultural yield due to high soil salinity, ecological

vulnerability from unpredictable rains, storm, tidal waves, dearth of industry and limited health facilities) make this area one of the most disadvantaged regions of the state of West Bengal (Chowdhury *et al.* 2001). Nearly half of the families in the region (41.3%) live below the poverty line (i.e., a family earning less than Rs. 1,000, or US\$ 21.70 per month). Agriculture is the primary occupation for 85.0% of the population (Ganguly, 2005) and pesticides are extensively used for cultivation (Chowdhury *et al.* 1999).

Community mental health research in the Sundarban region previously identified widespread concerns about DSH and suicide, mainly because of pesticide ingestion and the lack of effective treatment to prevent avoidable mortality (Chowdhury *et al.* 2003; Chowdhury *et al.* 2004). To document the burden of DSH and suicide, clinical epidemiological research was carried out in 6 island CDBs. From east to west, they are Gosaba, Basanti, Kultali, Patharpratima Namkhana, and Sagar (Fig. 2.1). This study documented the frequency of DSH and mortality from case registers of block primary health centres (BPHC).

Fig. 2.1 Six study health centres



Methods

Study Site

Research activities were planned in 6 island CDBs of the Sundarban region. The total population in these 6 islands is 1,142,686 (Census, 2001), predominantly Hindu. Socio-economically, Sagar is the most developed and Kultali and Gosaba are the least. Urban influence is most evident in Sagar and least in Gosaba, which retains traditions that are more indigenous. Ecological stress and the dangers of wildlife include attacks by tigers, crocodiles, sharks and snakes, which are more prevalent in Basanti, Gosaba and Kultali (Chowdhury *et al.* 2004).

A BPHC is the main clinical facility in each of these CDBs, typically with 15-30 beds and they provide both inpatient and outpatient services. There is one block medical officer (BMOH) and 1-4 medical officers (MO) in each BPHC, apart from nurses, who provide direct health service. Staffs also include, health assistants (20-50) and community health guides (5-10) who work in the community. These BPHCs are overstretched beyond their capabilities and they usually lack adequate resources and expertise to manage cases of poisoning. The BPHCs have insufficient atropine, the antidote for treating most cases of pesticide poisoning. Even when atropine is available patients must purchase PAM (Pyridine aldoxime methiodide), which is also prescribed. However, most patients cannot afford these expensive medicines.

Data collection

Information about DSH and suicide from 1 January 1999 to 31 December 2001 was collected from retrospective documentation, based on manual review of admission and emergency registers of the 6 BPHCs. The purpose of the study was communicated to the block medical officers in advance and data were collected in two phases. During the first phase, each BPHC was visited for a 2-week period to identify DSH cases in patient registers, extracted from the general clinic register. The hospitals did not maintain separate registers to record self-harm. Gosaba, Kultali and Patharpratima, however, maintained additional registers for emergencies and poisoning, which were also consulted. A second visit was made after the data were tabulated and examined. Clarifications were sought for missing data in the registers, consulting the case history sheets for selected records.

Cases of DSH were identified and analysed for the 3-year period. The demographic characteristics, the method, for DSH and resulting morbidities and mortalities of patients above the age of 10 years were studied. For children under 10 years of age, as it was assumed that pesticide poisoning was accidental.

Statistical Analysis

Data were analysed with Stata (Intercooled Standard version 8.0). Self-harm was the outcome variable having two levels, DSH and suicides. Patients with missing outcomes were excluded from the analysis. Bivariate logistic regressions were carried out to assess the relation between fatal outcome and individual variables sex, age groups, marital status, religion and method of self-harm. The model considered random effect at the hospital level to take into account possible correlation between study sites. A multivariate logistic regression model with backward stepwise selection was applied to identify the most significant risk factors for suicide. The removal level of covariates was taken to be at $p=0.1$ and it was based on the likelihood ratio test. In addition, a model was fitted for each hospital separately and results compared between hospitals. Case Fatality Rates (CFR) were calculated for each of the 6 hospitals. The percentage of DSH clinic visits was calculated after deducting the estimated child (0-9 years) visits from the total BPHC admissions, based on sampling every fifth page of the case registers (1999-2001) for the Namkhana BPHC. The distribution of age groups and sex were calculated based on the sample population ($n=354$). The findings were then extrapolated to calculate the percentage of 0-9 year children in the other 5 hospitals. It was assumed that all BPHCs have a similar structure of patients with regard to age and sex classes and thus, the same proportion of children (0-9) years was deducted from total patient numbers.

Results

A total of 1,277 DSH patients (405 in 1999, 433 in 2000 and 439 in 2001) were admitted to the 6 BPHCs, of which 77.7% patients (992) survived their attempt and 11.9% (152) died. The fate of the remaining 10.4% (133) cases was missing. The median age of the DSH patients was 24 years (range 10-95 years \pm sd 11.9). In all the BPHCs men were consistently older than women. The median ages of women and men were 22 and 26 years respectively. Most (72.5%) of the patients were young

adults (15-34 years). Nearly three quarters (72.2%) were married while a little more than a quarter (27.2%) were single. Majority (90.9%) of the patients were Hindus, followed by Muslims and other religions.

The percentage of clinic visits for DSH among patients over 10 years of age varied among the different BPHCs, the highest (14.8%) being recorded at Patharpratima and the lowest (3.2%) at Gosaba (Table 2.1).

Table 2.1: Percentage of clinical consultations for DSH among patients ≥ 10 years-of-age in the 6 Block Primary Health Centres during 1999-2001

BPHCs	Admissions ≥ 10 years	DSH	%
Basanti	846	48	5.7
Gosaba	2,889	91	3.2
Kultali	1,484	161	10.8
Namkhana	5,650	322	5.7
Patharpratima	1,950	289	14.8
Sagar	6,584	366	5.6
Total	19,403	1,277	6.6

More women than men were admitted to all 6 BPHCs for DSH (Table 2.2). The distribution of admissions for women and men were similar in all the BPHCs except Kultali, where female admissions were highest (75.2%). The difference between women and men DSH admissions in the 6 hospitals was not significant (Fisher's exact test). Of the DSH patients, 65.2% were women and among the subset of suicides, 67.1% were women.

Table 2.2: DSH Admissions and mortality in the 6 Block Primary Health Centres during 1999-2001

BPHCs	All self-harm				Non-fatal DSH				Suicide				Uncertain			
	T	F	%	M %	T	%*	F	M %	T	%*	F	M %	T	%*	F	M %
Basanti	48	64.6	35.4		24	50.0	62.5	37.5	24	50.0	66.7	33.3	0	0.0	0.0	0.0
Gosaba	91	61.5	38.5		74	81.3	60.8	39.2	9	9.9	55.6	44.4	8	8.8	75.0	25.0
Kultali	161	75.2	24.8		130	80.7	75.4	24.6	8	5.0	87.5	12.5	23	14.3	69.6	30.4
Namkhana	322	61.5	38.5		251	78.0	63.7	36.3	40	12.4	60.0	40.0	31	9.6	45.2	54.8
Patharpratima	289	64.4	35.6		249	86.2	64.7	35.3	24	8.3	83.3	16.7	16	5.5	31.3	68.7
Sagar	366	62.6	37.4		264	72.1	63.6	36.4	47	12.8	63.8	36.2	55	15.0	56.4	43.6
Total	1,277	64.3	35.7		992	77.7	65.2	34.8	152	11.9	67.1	32.9	133	10.4	54.1	45.9

* Percentage of admissions for non-fatal DSH and suicide, and DSH with uncertain outcome

Collectively, the CFR rate was 13.3% (sd ± 15.0) (Table 2.3). The highest CFR was found in Basanti (50.0%) and the lowest in Kultali (5.8%).

Table 2.3: Case fatality rate (CFR) for DSH in the 6 Block Primary Health Centres during 1999-2001

BPHCs	Cases	Suicides	CFR (%)
Basanti	48	24	50.0
Gosaba	83	9	10.8
Kultali	138	8	5.8
Namkhana	291	40	13.7
Patharpratima	273	24	8.8
Sagar	311	47	15.1
All sites	1,144	152	13.3

Pesticides were the most common method for self-harm, both for DSH and suicide (Table 4). Indigenous poisons, found abundantly in the region, were the next most frequently used for self-harm. The indigenous poisons include yellow oleander (*Thevetia peruviana*) and dhatura (*Datura stramonium*). For 5.1% patients, the type of poison was unknown.

The combined CFR of all methods of DSH was 74.0%. The CFR was the highest for kerosene ingestion and the lowest for overdoses of prescribed medicines and hanging.

Table 2.4: Methods used by patients to attempt self-harm

Methods	Total	%	DSH	%	Suicide	%	CFR
Pesticides	1015	88.7	877	88.4	138	90.8	13.6
Indigenous Poisons	33	2.9	30	3.0	3	2.0	9.1
Kerosene	11	1.0	9	0.9	2	1.3	18.2
Burning	10	0.9	9	0.9	1	0.7	10.0
Drowning	9	0.8	8	0.8	1	0.7	11.1
Medicines	7	0.6	7	0.7	0	0.0	0.0
Hanging	1	0.1	1	0.1	0	0.0	0.0
Unknown Poison	58	5.1	51	5.1	7	4.6	12.1
All methods	1,144*	100.0	992	100.0	152	100.0	9.3**

* Patients with uncertain outcome (n=133) was excluded from the calculation

** Crude mean CFR of all methods

The variables associated with suicide are reported in table 2.5. The age group 45-54 years was at highest risk of death from DSH, and patients in the 15-24 year age group were at lowest risk. The higher lethality of DSH from pesticide ingestion compared with other methods was suggestive, but not significant.

Table: 2.5: Determinants of mortality from deliberate self-harm (n=1,144)

Variables	Bivariate Analysis			Multivariate Analysis		
	OR	95% CI	P value	OR	95% CI	P value*
Age (n)						
15-24 yrs (525)	1.0	-		1.0	-	
10-14 yrs (82)	0.17	0.40-0.71		0.2	0.03-0.78	
25-34 yrs (313)	1.21	0.76-1.91		1.3	0.82-2.19	
35-44 yrs (118)	0.86	0.45-1.6	0.0003	0.9	0.48-1.9	0.007
45-54 yrs (54)	2.22	0.99-4.97		2.6	1.20-5.44	
55-64 yrs (26)	2.78	1.04-7.39		2.7	0.96-7.46	
> 65 yrs (26)	1.72	0.61-4.81		2.0	0.67-5.93	
Sex (n)						
Female (749)	1.0	-		1.0	-	
Male (395)	0.87	0.60-1.26	0.155	0.8	0.49-1.13	0.17
Marital status (n)						
Married (838)	1.0	-		1.0	-	
Single (299)	0.55	0.35-0.87	0.006	0.9	0.53-1.68	0.73
Others (7)	3.04	0.63-14.50		2.0	0.34-11.80	
Religion (n)						
Hindu (1041)	1.0	-		1.0	-	
Islam (101)	0.68	0.35-1.34	0.105	0.7	0.37-1.48	0.14
Others (2)	6.94	0.40-119.69		20.37	1.01-409.33	
Method (n)						
Pesticide (1015)	1.0	-		1.0	-	
Non-pesticide (129)	1.60	0.87-2.91	0.056	1.66	0.89-3.06	0.09

* p- value calculated for the grouped variable

Discussion

This study clarified the clinical epidemiology of DSH and suicide with pesticides in 6 islands of the Sundarban region. Community concerns had indicated DSH and suicide are serious problems, but epidemiological data were lacking. Findings are notable with respect to 4 important issues: variable but substantial clinical burden of DSH, high frequency of pesticides as the means of DSH, high and variable CFRs and poor quality of DSH and suicide data in the BPHCs.

Substantial clinical burden of DSH

Although one may assume that many cases of DSH in this remote region do not present for treatment at the BPHC, DSH was responsible for more than 5.0% of clinic consultations in these 6 centres. Considerable differences in clinical rates of DSH at the different BPHCs were also noted. Our study did not distinguish different rates of DSH in the community from different levels of access to care owing to the location of the BPHCs and the health-seeking behaviour of the local population. With respect to spatial patterns of variable help-seeking, it was noted that people travel from coastal areas to urban towns for help seeking.

In Patharpratima, the BPHC is situated at the northern end of the island and transportation out of the island is limited and difficult. Thus, patients on the island are compelled to seek help from the designated health facility on this island. This is also true for Kultali. On Sagar Island, the BPHC is easily accessible to most people because of its central location. However, many patients, especially in the northern part of the island, where the ferry is located, preferred to attend a mainland district-level hospital, where they expect to receive better treatment. Basanti, Gosaba and Namkhana islands are divided by rivers into 2 major segments (north and south), and the BPHCs are located in the southern sector. Residents of the northern sector of these islands less frequently use services of the local BPHCs, since they have easier access to sub-divisional or district hospitals. Consequently, the magnitude of the identified clinical burden of DSH identified in our study should be regarded as a conservative assessment of the problem in the community.

Frequent use of pesticides for DSH

Pesticide poisoning was the method of self-harm for most hospital DSH admissions. Previous research in the region (Chowdhury *et al.* 2003; Chowdhury *et al.* 2004) and other studies of self-harm conducted in agrarian societies of low-and middle-income countries emphasise the role of pesticides as the method of choice for DSH and suicide (Moghadamnia & Abdollahi, 2002; Phillips *et al.* 2002; Gunnell & Eddleston, 2003; Kalkan *et al.* 2003; Nesime *et al.* 2004; Thanh *et al.* 2005). Unsafe storage of pesticides may result in accidental deliberate and occupational exposures. Unrestricted access facilitates impulsive self-destructive behaviour with highly toxic chemicals. Questions about access and storage bridge the interests of accident prevention, occupational health and mental health.

Approaches to reducing deaths from pesticide poisoning include development of alternatives to agricultural pesticides. One such approach is a feature of Integrated Pest Management (IPM), a management strategy using non-chemical and biological control agents with limited use of pesticides. IPM aims to achieve minimum cost to the cultivator and to minimise harmful effects on the environment (Tang *et al.* 2005). For farmers who rely on pesticides, safety measures should include restricting the sale of very toxic pesticides, improving storage facilities to prevent accidental exposures and impulsive self-harm and decreasing their lethality by adding emetic agents to all pesticide products (Roberts *et al.* 2003). Reducing toxicity and access are cornerstones of prevention strategies (Gunnell & Frankel, 1994). A study conducted in Samoa (formerly Western Samoa) showed that Paraquat-related suicide rates declined after its partial restriction (Bowles, 1995).

For suicide prevention it is also important to increase public awareness of mental illness and to recognise the typical socio-cultural contexts in which pesticides are consumed (Chowdhury & Weiss, 2004). Intersectoral strategies that combine regulatory activities to minimise impulsive access to hazardous pesticides and to acknowledge the role of mental health problems, psychosocial contexts and stressors that lead to DSH and suicide should guide health policy and community actions.

High and variable Case Fatality Rates

The CFR of DSH in the study BPHCs was higher than in most industrialised countries, which are typically less than 1.0% (Gunnell *et al.* 2004). The CFR for poisoning is typically much

higher than 10.0%, in low-income countries (Hettiarachchi & Kodithuwakku, 1989a&b; Eddleston, 2000; Gunnell & Eddleston, 2003). It is not the quality of clinical care, but also the particular agents used in self-harm that accounts for differences in mortality. The substances consumed in overdose in high-income settings are typically prescribed or non-prescription drugs that are less toxic than lethal pesticides. Other factors, such as proximity to the health centre, lack of drugs, availability of antidotes (Eddleston *et al.* 1998), and an absence of uniform management guidelines to treat self-harm patients also contribute to the higher CFRs.

High CFRs indicate the need to improve case management in the BPHCs particularly in Basanti, where rates were highest. Kultali and Patharpratima, which were better equipped, had lower fatality rates. Both clinical training and resources to make use of clinical skills are needed. Site-specific monitoring of CFR is also required to identify problems, support efforts to acquire needed resources and to track the impact of improved services. Establishing guidelines to manage self-harm patients, training medical personnel, and ensuring the availability of cheap antidotes in households and BPHCs are appropriate measures that will reduce pesticide mortality.

Poor quality of DSH and suicide data in the BPHCs

In this study, the outcome for 10.0% of the DSH patients was not recorded. This represents another aspect of health system problems and neglect of mental health priorities due to the poor quality of DSH and suicide mortality data (Bertolote & Fleischmann, 2002). Improved surveillance for DSH and pesticide poisoning would contribute to the quality of care and mental health services. This requires developing standards for documenting DSH and suicide and training medical staff to maintain records. Because there was no such system, a DSH register was developed for this study. These registers were distributed in all the Sundarban BPHCs to establish a uniform DSH surveillance system in the region. Our training for this study is also intended to facilitate sustained surveillance from improved BPHC clinic data.

Limitations

Although this study is important as the only source of information about the clinical epidemiology of DSH and suicide in the 6 islands of the Sundarban region, certain limitations are also

acknowledged. Because many DSH patients do not reach medical facilities and only the serious cases seek help from the BPHC, clinic-based DSH data provides conservative estimates of the community burden. The low CFR for hanging reflects the fact that only cases who live long enough after such a lethal attempt reach the hospital. Further research on the other types of health care services used by self-harm patients, community surveys of DSH and suicide and development of a regular surveillance system in all the blocks of the region are required for a more comprehensive and accurate account of the problem in the region.

Conclusion

This study has documented health problems that are typically neglected but which routinely confront health services. We have suggested measures to prevent DSH and to improve management and the CFR of pesticide poisoning. The agricultural department should be involved in campaigns promoting safe pesticide practices through out the region. This study also indicates the need for intersectoral programmes linking health departments with agricultural departments to ameliorate the problem of self-harm with pesticides and to reduce mortality from all types of pesticide poisoning, both accidental and intentional. Intersectoral systems-oriented approaches to DSH and suicide are needed for effective prevention strategies in India and settings elsewhere where pesticide-related DSH and suicide are important public health problems.

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Chapter 3

Patient-reported reasons for deliberate self-harm - study from a Sundarban health centre, India

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Abstract

Non-fatal deliberate self-harm (DSH) and suicide contribute substantially to global morbidity and mortality. They are important public health concerns for mental health throughout the world but, a neglected topic in remote corners of the low-and middle-income countries such as in the Sundarban region, West Bengal, India. Most research on DSH and suicide focuses either on sociodemographic characteristics or psychiatric risk factors, ignoring the contribution of distinct socio-cultural and situational contexts of suicidal behaviour. This study examined patient-reported triggers, underlying problems, perceived causes of the problems, and help seeking among 40 DSH patients admitted to the Dwariknagar Block Primary Health Centre (BPHC) of the Sundarban region. Patients were interviewed using an in-depth semi- structured EMIC interview. Women constituted 67.5% of the study sample. Many of the patients had secondary education (47.5%) and were married (67.5%). Household work (47.5%) was the main occupation reported. Nearly all patients associated their DSH with social and interpersonal conflicts as the underlying cause (95.0%) and 50.0% identified a quarrel as the trigger event. More than half the patients had not sought any help for the problem that provoked the DSH event (57.5%). Social and interpersonal conflicts represent a substantial patient-perceived burden that motivates suicidal behaviours, for which patients often do not seek formal help. These risk factors and their social contexts should be acknowledged in clinical practice with DSH patients and in communicating risks, sources of help and the role of mental health services for community action to prevent suicide and promote mental health.

Introduction

Throughout India, research suggests that non-fatal deliberate self-harm (DSH) and suicides is a major public health problem (Thomas *et al.*, 2000; Gautami *et al.*, 2001; Batra, *et al.*, 2003; Aaron *et al.*, 2004; Mohanty *et al.*, 2004; Bawaskar & Joshi, 2005; Fleischmann *et al.*, 2005; Srinivas Rao *et al.*, 2005; Srivastava, *et al.*, 2005; Gargi *et al.*, 2006; Singh & Unnikrishnan, 2006; Alex *et al.*, 2007) but in some areas the problem is more serious. In 2001, the state of West Bengal, one of India's 28 states, reported a suicide rate of 17.1 per 100,000 people, which was higher than the national average of 10.6 (Government of India, 2002). Many of these suicides are due to pesticide ingestion, particularly in agricultural areas, such as the Sundarbans, a geographically remote agrarian region of West Bengal (Chowdhury *et al.*, 2003; Chowdhury *et al.*, 2004). In the late 1990s, during a community mental health research in the region, the local inhabitants and medical personnel raised concerns about the magnitude of the problem and the ease of availability of pesticides in the Sundarban region (Chowdhury *et al.*, 2003). Responding to the requests and needs of the local community a programme of community mental health services was developed which combined research, clinical services, and community interventions to prevent DSH and suicides in the Sundarban region.

Suicide research across the world has primarily been concerned with epidemiological, sociological, medical, and psychiatric risk factors of suicidal behaviour (Mann & Stoff, 1997; Conner *et al.*, 2001; Maltesberger, 2001; Goldney, 2002; Maris, 2002). As a result, preventive interventions for DSH and suicide remain largely oriented to case findings and psychiatric treatment which reflect professional perspectives. In contrast, a comprehensive approach to suicide prevention considers the biological, psychological, socio-cultural and situational stressors that influence suicidal behaviour (WHO, 2001), including patients' perceptions (Flanagan *et al.*, 2007). Several studies have suggested that such an integrated approach offers practical benefits (Hammond, 2001; Lamberti *et al.*, 2001; De Leo, 2002; Goldsmith *et al.*, 2002;), but such DSH and suicide research are few in number (Wesseling *et al.*, 1997; Bertolote *et al.*, 2006).

Further, DSH and suicide studies, conducted in Western settings emphasise psychopathology (Harris & Barraclough, 1997; Isometsa, 2001; Hawton *et al.*, 2003; Scocco *et al.*, 2007) whereas those carried out in Asian countries highlight the importance of social contexts and stressors (Zhang *et al.*, 2000; Gururaj & Isaac, 2001; Phillips *et al.*, 2002; Parkar *et al.*, 2006).

Given our interest in clarifying the socio-cultural risk factors and aiming to understand patients' perspectives, this study interviewed patients admitted at the Dwariknagar Block Primary Health Centre (BPHC) on Namkhana Island, in the Sundarban region. It was particularly concerned with patients' accounts asking them about triggers, underlying problems (UP), perceived causes (PC), and help seeking (HS) related to the UP leading to DSH. Such information was collected by employing a cultural epidemiological approach which integrates anthropological orientations and epidemiological methods (Weiss, 1992).

Methods

Study site

This study was conducted at the Dwariknagar Block Primary Health Centre (BPHC) on Namkhana island of the Sundarban region, India. The Sundarban region derives its name from the Sundari (*Heritiera fomes*) trees denoting 'beautiful forest' (Naskar, 1998). Approximately 60.0% of the Sundarban region lie in Bangladesh and the remaining in India (Banerjee, 1998). The Indian Sundarban region is located at the southernmost tip of West Bengal, one of the 28 Indian states. The region comprises both island and mainland community development blocks (CDB) which are the lowest level administrative unit of a district in the rural areas. These CDBs have a population between 150,000 to 200,000. Namkhana is one of the Island CDBs of the Sundarban region. It is situated 105 kilometres south of the state capital, Kolkata (formerly Calcutta), and covers an area of 227 square kilometres with a population of 160,627 (Census, 2001).

The Block Primary Health Centre (BPHC) is the largest government health facility, which is located at Dwariknagar, one of the 34 villages of Namkhana and has 15 beds. The BPHC provides in-patient services and has one block medical officer (BMOH) and two medical officers (MO), apart from nurses, who provide direct health service. Staffs also include health assistants (20-50) and community health guides (5-10) who work in the community. The BPHC in Namkhana provides health services to the people of the Island. There are no designated mental health services, and people with serious mental illness are compelled to travel to distant cities for psychiatric care or seek help from local providers who lack specialty training.

Instrument

The basic tool of cultural epidemiology is a semi-structured EMIC interview, locally adapted for study of a particular health problem in a particular setting. EMIC interviews are used to elicit complementary narratives and to specify representational categories of illness experience, meaning and behaviour (Weiss 1997; Weiss, 2001). For this study, prior ethnographic research informed the selection of appropriate categories of DSH-related UP, illness meanings coded as PC and help-seeking behaviour HS for the underlying problem and triggers associated with the DSH event. An EMIC interview had been previously developed for the study of DSH patients in another island of the Sundarban region. A pilot study of ten patients and experience from the previous research guided revisions and produced the final version used in this study (Chowdhury *et al.*, 2001 a & b).

Training Researchers

The instrument was administered by the first author who had received training previously during a prior mental health project. Training comprised explanation of aims and objectives and both interactive and instructive discussion sessions were held to ensure familiarity with the concepts and related literature.

Data collection

The study assumed Prof. Keith Hawton's (2002) definition of DSH mainly that it refers to an act of non-fatal DSH, without attempting to judge the lethality of intent in applying the term. All consecutive patients admitted for DSH to Dwarknagar BPHC from January 2002 to August 2003 were interviewed when stable after admission (after 2-5 days) and informed consent was obtained from the patient and the family. The assessment of DSH was made by the BMOH who referred a total of 54 patients of which 9 refused to be interviewed. Three interviews were abandoned because patients did not want to continue, and for two patients, their physical condition deteriorated and the interviews could not be completed. Our study sample comprises 40 completed interviews. No particular room was assigned for conducting the interviews. Rooms which were free and available during the time of the interviews were used.

The research protocol was approved by the Gram Panchayat (GP or local administrative agencies) in Namkhana and the Block Medical Officer of Health (BMOH). EMIC interviews were conducted in the local language, Bengali between January 2002 and August 2003. The interviews were conducted over one or two sessions, depending on the physical and emotional condition of the patient. The usual length of an interview was 60-90 minutes without the presence of family members. We requested permission to tape the interviews, and for the two patients who objected, written notes were made. Interviews were transcribed and translated into English. The EMIC interviews elicited both narrative accounts and categorical codes specifying categories triggers, UPs, PCs and prior help-seeking for the UP.

Data analysis

The data set includes coded variables for quantitative analysis and narratives for qualitative data. They were coded for thematic substance with reference to specific questions in the interview. In the interviews cultural epidemiological determinants in key sections of the quantitative data set specified triggers leading to DSH, categories of UP that contributed to the DSH, PC of the DSH as perceived by the patient and prior HS for the UP prior to the DSH attempt. UPs were considered to be spontaneously emphasised or mentioned depending on the patients' narratives. Methods used to attempt DSH were post coded from narratives. Cultural epidemiological variables for triggers, UP, PC and prior help-seeking were each analysed to specify the frequency of responses. Quantitative data from EMIC interviews were entered in Microsoft Access and analysed with Stata (Intercooled Standard version 8.0). Descriptive analysis examined the frequency of reported categories and the fraction reporting it spontaneously, rather than only in response to category-specific probes.

Narrative data were managed and analysed with MAXqda software for qualitative data analysis. MAXqda facilitates qualitative analysis by providing access to coded text segments from selected records. Importing variables from the quantitative data set in Access and analysis variables derived in Stata made it possible to examine thematically coded segments of narrative responses from strategically selected records. These narratives in the EMIC interviews helped to identify sociocultural themes of DSH.

Results

Sociodemographic characteristics

The study sample consisted of 40 patients, of which 27 (67.5%) were women. The median age of the patients was 25.5 years (range 12-72 \pm 13.9). Male patients were older than their female counterparts. Most (67.5%) of the patients were married, 5.0% were widowed, and the rest were single. The study population were primarily Hindu (92.5%) and the remaining Muslim and many (47.5%) of the patients belonged to a low Hindu caste (Mahishyas) of primarily agricultural labourers. Nearly half (47.5%) of the patients had a secondary education, 17.5% had a primary education, and the remaining 35.0% had had no formal education. Women were mostly involved in household work (47.5%), and other reported occupations include farming, trade or business.

Features of DSH

Nearly all (82.5%) of the patients in the study had used pesticides in their DSH attempt. The remaining patients had used different types of indigenous poisons, mainly yellow oleander (*Thevetia peruviana*) (12.5%). An overdose of prescribed medication and hanging accounted for 2.5% of the self-harm methods. Among the 40 patients interviewed for self-harm, 10.0% reported having previously attempted DSH, and all of these patients had used pesticides in these prior attempts. Most (40.0%) of the patients attempted DSH immediately after having had thoughts about self-destruction. More than 60.0% of the sample acted within five hours of such a thought, and 85.0% of the patients reported acting within 24 hours of their first thoughts about suicide (Table 3.1).

Table 3.1: Time between first thoughts about self-destruction and the DSH attempt.

DSH time (in hrs)	Freq	%	Cum %
Within 10 minutes	16	40.0	40.0
Within half hour	1	2.5	42.5
Within five hours	8	20.0	62.5
Within ten hours	5	12.5	75.0
Within twenty-four hours	4	10.0	85.0
Within one week	3	7.5	92.5
More than one week	3	7.5	100.0
Total	40	100.0	

Situational Factors

Narratives in the EMIC interviews revealed some thematic contexts such as family problems involving children, in-laws, parents and spouse. Physical and verbal abuse played an important role in motivating the DSH event. Patients identified various underlying problems as motivation for DSH, perceived causes of their problems and immediate triggers of their suicidal behaviour. Each of these constitutes a different but complementary aspect of the motivations for DSH. The following sections present findings for each.

Triggers

Triggers are those events that immediately precipitated the self-injury behaviour (Table 3.2). Verbal quarrel (50.0%) was the most frequently reported category of trigger, particularly with spouse (17.5%) and parents (12.5%). In some cases, the trigger was a direct provocation to end one's life in the course of the quarrel. The following examples illustrate nature of the interpersonal conflicts, which were often between family members. In one instance, a young female patient reported that her sister-in-law suggested that she commit suicide in order to maintain peace within the household:

She said, "Get out, there will be peace if you die." Then I felt extreme remorse and went to the latrine and consumed it.

In another case, a young girl refused to marry the boy who had proposed to her. He became despondent and told his aunt that he would hang himself because of the girl's refusal to accept the marriage proposal. The girl reported,

His aunt said to me, "Why should the boy have to die for you? If he dies then,

you should also go and die. You have no right to live.” And so, I tried to hang myself.

Table 3.2: Triggers for DSH (n=40)

Triggers	Freq	%*
Verbal Quarrel	20	50.0
Child(ren)	3	7.5
In-laws	2	5.0
Parents	5	12.5
Spouse	7	17.5
Other interpersonal	3	7.5
Physical abuse (by)	7	17.5
Children	1	2.5
In-laws	3	7.5
Spouse	3	7.5
Social humiliation	4	10.0
Direct provocation	2	5.0
Beaten for the first time	2	5.0
Others	5	12.5
Acute financial crisis	1	2.5
Extreme physical pain due to chronic illness	1	2.5
Quarrel between parents	1	2.5
Quarrel between parents and in-laws	1	2.5
Rumours about loss of property	1	2.5
Total	40	100.0

* % is calculated on the total number (n=40)

Patient identified problems (Underlying problems- UP)

While the triggers of the DSH event were those events that immediately provoked the self-injury, these triggers typically occurred within the context of other UPs that contributed to the motivation to harm oneself (Table 3.3). The most frequently reported and spontaneously emphasised problems were ongoing verbal abuse or insults, interpersonal conflicts, and a pattern of physical abuse. Sadness/hopelessness was also spontaneously emphasised by 22.5% of the study population. For men and women these conflicts typically focused on problems with in-laws and spouse.

Interpersonal conflicts commonly referred to marital discord, which was often instigated by infidelity. Partners who confronted their spouses about their infidelity often faced verbal and physical

abuse. The victim of such a quarrel reported,

We had a quarrel when I suspected that my husband was having an affair with my daughter-in-law. My husband and son beat me ruthlessly. Until now, I have borne everything silently but, I cannot take it anymore. It is too much. So, I consumed poison.

Traditional Indian marriages typically require a new bride to live with her husband's family, where she is expected to take on numerous responsibilities and is often ridiculed and blamed for conflicts within the household. As a result, quarrels between in-laws were commonly reported by female DSH patients. However, male patients also reported having quarrels with their in-laws. Problems with one's spouse and in-laws were the most frequently reported most troubling problem, this was for both men and women. One male patient's narrative reflects both kinds of domestic conflicts, and indicates how serious such conflicts may become,

There was a quarrel at home, a tiff with my wife. She went off to her father's house. I went to bring her back after 10 or 15 days. When I went to fetch her, my brother-in-law, mother-in-law, and some local people beat me up. They flashed knives and pistols at me. They were conspiring to kill me.

Table 3.3: Underlying problems of DSH (n=40)

Underlying Problems	Sp- Emphasis	%	Sp- Mention	%	Total	%
Conflict with child(ren)	6	15.0	0	0.0	6	15.0
Conflict with In-laws	13	32.5	1	2.5	14	35.0
Conflict with parent(s)	1	2.5	8	20.0	9	22.5
Conflict with sibling(s)	2	5.0	1	2.5	3	7.5
Conflict with spouse	22	55.0	4	10.0	26	65.0
Other interpersonal conflict	6	15.0	1	2.5	7	17.5
Disease (self)	2	5.0	0	0.0	2	5.0
Financial problems	2	5.0	0	0.0	2	5.0
Infertility	1	2.5	0	0.0	1	2.5
Physical abuse	14	35.0	2	5.0	16	40.0
Poverty	1	2.5	0	0.0	1	2.5
Sadness-hopelessness	9	22.5	1	2.5	10	25.0
Scholastic	1	2.5	1	2.5	2	5.0
Tension worry	5	12.5	1	2.5	6	15.0
Fear (losing property, prestige etc.)	5	12.5	0	0.0	5	12.5
Verbal abuse/ insult	25	62.5	1	2.5	26	65.0
Other victimisations	5	12.5	3	7.5	8	20.0
No problem	1	2.5	1	2.5	2	5.0

Perceived causes (PC)

Reported perceived causes of the DSH event are summarised in figure 3.1 which shows the distribution of perceived causes reported by the DSH patients either spontaneously or only following a probe.

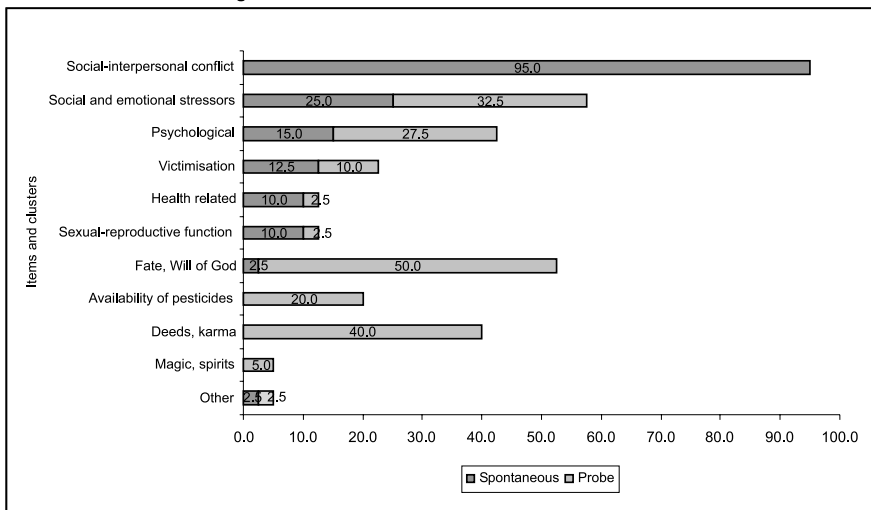
In most cases (97.5%), patients identified the cause of the DSH attempt with the underlying problems that precipitated the event. Nearly all patients, for example, reported social and interpersonal conflicts as the cause of their DSH attempt. When probed, traditional ideas about karma (40.0%), fate and the will of God (50.0%) were mentioned.

Although only 5.0% of patients reported magic or spirits, nearly all of them did so after probing. Similarly, patients more often stated emotional and psychological causes of their DSH behaviour, only after asked directly about that, rather than spontaneously in their narrative.

The easy availability of pesticides was identified by 20.0% of patients as a cause for their DSH. One patient explained ,

Yes, that is a reason. I knew that there was poison at home, so without thinking, I took it. Maybe, if it would not have been there, I would have again gone off to my maternal uncle's house.

Fig 3.1: Perceived causes of DSH



Help seeking

Few patients sought any help for the underlying problems they associated with of their DSH. Among those who did seek help, it was primarily from friends or family. Among those who sought external assistance, most consulted the government hospital, healing temple and village leaders or elders (Table 3.4).

Table 3.4: Help-seeking categories for underlying problem prior DSH (n=40)

Help-seeking categories*	Spon	%	Probe	%
Druggist/pharmacist	1	2.5	0	0.0
Faith healer/Gunin	2	5.0	0	0.0
Friends or family	12	30.0	2	5.0
Government hospital	3	7.5	0	0.0
Healing temple	3	7.5	0	0.0
Homeopath	1	2.5	0	0.0
Local herbal healer	1	2.5	0	0.0
Other specialist	1	2.5	0	0.0
Private practitioner/clinic	2	5.0	0	0.0
"Quack"	2	5.0	0	0.0
Referral consultant	1	2.5	0	0.0
Self-care	0	0.0	1	2.5
This clinic	1	2.5	0	0.0
Village leader or elder	3	7.5	0	0.0
Other	3	7.5	0	0.0
None	23	57.5	0	0.0

* One person mentions more than one help-seeking category

Discussion

The cultural epidemiological approach provided an opportunity to examine and understand the synergistic relationship between triggers, underlying problems of DSH, individual perceptions of the causes of these problems, and related help seeking behaviour as reported by patients themselves.

Findings of this study indicate the relevance of socio-cultural stressors; the contribution impulsivity during stressful moments along with the easy availability of the methods of self-harm and the nature of help-seeking of the UP prior to the DSH event.

Importance of socio-cultural stressors

Results from this study identified situational and cultural stressors patients associated with their DSH attempts, indicating their relevance in Indian and other Asian communities. Similar findings have been expressed in studies by Bhatia *et al.*, (1987); Girdhar *et al.*, (2004); Parkar *et al.*, (2006); Banerjee & Sauerborn, (2006). The disadvantage of female gender roles contributes to the vulnerability of women. Domestic violence and verbal abuse were frequent themes. They are institutionalised and not even considered problems unless excessive beyond the norm, perpetrated by others in the household apart from the husband. Arguments motivating DSH, typically between family members and spouses, were identified by patients as triggers, underlying problems, and perceived causes of their DSH. Socio-economic (financial problems, poverty) or health-related issues (infertility, disease) were rarely mentioned. Probed responses identifying fate, karma, and the will of God were often mentioned as a way of indicating hopelessness and the inevitability of their suicidal behaviour. They indicated that such patients could not identify a cause they thought they could do something about. Abuse played an important role in interpersonal conflicts, some of which is accepted socially and culturally. For example, although patients' were resilient to spousal domestic violence, abuse outside this relationship precipitated suicidal behaviour.

Socio-cultural stressors of suicidal behaviour as perceived by patients are widely represented in popular literature but receive little attention in academic research and prevention programmes. Current research on suicide prevention continues to be guided by epidemiological, psychiatric, sociological studies which reflect professional perspectives. In his article, Knox and colleagues (2004) are of the opinion that a suicide prevention programme which combines both the professional as well as patient perspectives is more likely to reduce suicide rates. McElroy (2004) in his analytical presentation of broad-spectrum approach to suicide prevention emphasised that "...the majority of self-harming and suicidal patients require 'psychological' help...."

Findings from this study suggest particular situational and cultural stressors that constitute risk factors, which should be considered in formulating strategies for DSH and suicide prevention.

The role of impulsivity and easy access to means of self-harm

Most of the DSH patients in the study reported harming themselves almost immediately

after they first considered the idea. Similar findings have been reported by a study conducted by Centre for Disease Control and Prevention in China (2004); Eddleston & Phillips (2004) and Bridge (2006). There is a close association between the role of impulsivity and the easy access to means of self-harm, pesticide in this case. Restricting the availability of the methods of self-harm may have an impact on DSH and suicide rates. The detoxification of domestic gas in United Kingdom in the 1960s, lead to decline in suicide rates and saved up to an estimated 6,700 lives (Kreitman, 1976; Low *et al.*, 1981). A study in Samoa (previously Western Samoa) showed that there was a positive effect on the Paraquat-related suicide rates after the product was partially banned (Bowles, 1995).

Such interventions could either directly prevent acts of DSH or provide time for other interventions in order that impulsive acts may be avoided (Murphy & Puffet, 1995)

Help-seeking

Most DSH patients did not seek help for their UPs. For those who did seek help, it was primarily from friends and family. Eagles and colleagues (2003) in their study of patients' perspectives of DSH found that patients considered confiding in family and friends as helpful. Our findings are contrary to findings from studies conducted in the West, which indicate a visit to the medical doctor prior to the attempt. The socio-cultural and interpersonal stressors that precipitated the DSH event, therefore, are not commonly identified as risk factors for a clinical condition.

Awareness of risk factors within the community and mobilisation of social support for those vulnerable to DSH may also help to reduce DSH and ultimately prevent suicide. Similar findings have been reported by Heikkinen *et al.*, (1993); De Leo *et al.*, (1995) and Stack (2000) .

Limitations of the study

Although this study is the only one of its kind in the Dwariknagar BPHC of the Sundarban region, certain limitations of the study are acknowledged. This data set lacks the psychiatric assessment which would be useful in comparing the relative role of psychopathology and situational and cultural stressors. This study is limited by the small sample size which makes it difficult to generalise these findings to the community at large. Further research is warranted with a larger sample to facilitate generalised conclusions to inform and influence policy on DSH and suicide.

Conclusion

Patients' experience and understanding of DSH is not only important for the evaluation of their cultural risk factors but also inform the development and implementation of more focused and effective management strategies (Sinclair & Green, 2005). Involvement of service users in policy making and research is being increasingly advocated. Hence, patients' views on suicide prevention strategies are vital and thus documenting their experiences is a prerequisite to delineate the risk factors for prevention (Eagles *et al.*, 2003; Faulkner & Thomas, 2002).

Findings from this study clarify the reasons given in patients' accounts of DSH. They raise questions about ways of reducing these stressors and methods of making supports available that promote resilience in the identified contexts of vulnerability to social and familial conflict. In the context of prevention, persistent familial conflicts should be recognised as a risk factor for DSH in these communities. Prevention programs should consider the role of interpersonal disputes in suicidal behaviour and community mental health services should address these issues in clinical care.

Fig. 3.2: EMIC interview with a DSH patient



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Chapter 4

Household survey of pesticide practice, deliberate self-harm and suicide in the Sundarban region of West Bengal, India

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Abstract

Objective: To estimate the extent of suicidal behaviour, both non-fatal deliberate self-harm (DSH) and suicides and clarify issues relating to pesticide practice in the Namkhana Island of the Sundarban region in India.

Methods: Based on a mixed random and cluster design sampling a cross-sectional study was conducted in 1,680 households 21 villages. The survey questionnaire “Household Information on Pesticide Use and DSH” was developed and used by the research team to elicit qualitative and quantitative information of agricultural practice, pesticide use including respondents’ and investigators’ responses on the issue of safe storage of pesticide and suicidal behaviour from the study households. Kappa statistic and McNemar’s test were used to assess the level of agreement and association between respondents’ and investigator’s opinion about safe storage of pesticide. Rates of suicidal behaviour were computed.

Results: Of the 1,680 households, 72.7% reported using pesticides for agricultural purpose and 50.4% of these households stored pesticides at home. There were 181 incidents of suicidal behaviour in 169 households over a period of five years. Conflict with family members was the most frequently reported reason for suicidal behaviour (53.6%). The kappa statistic indicated poor agreement between respondents and investigator about safe storage of pesticides. The overall annual rates for DSH and suicide were 256.0 (95% CI 215.0-302.4) and 84.7 (95% CI 61.8-113.2) per 100,000 population respectively. The pesticide-related annual DSH and suicide rates were 158.1 (95% CI 126.2-195.5) and 73.4 (95% CI 52.2-100.3) per 100,000 persons respectively.

Conclusion: High rates of pesticide-related suicidal behaviour indicate it is a major public health problem. A combination of factors including unsafe pesticide practice and psychosocial stressors are related to the suicidal behaviour. An intersectoral approach involving the administration, agricultural department, community and the health sector would help to reduce the magnitude of this public health problem.

Introduction

Nearly two decades ago the World Health Organisation (WHO) estimated 3,000,000 people were hospitalised for pesticide poisoning each year throughout the world, two-thirds due to intentional poisoning, and 7.3% of the total number resulting in mortality (WHO & UNEP, 1990). Since the publication of this report, a number of studies have indicated that suicidal behaviour including non-fatal deliberate self-harm (DSH) and suicides, particularly with pesticides is a serious global public health problems in many low-and middle-income countries (Jeyaratnam, 1990; Forget, 1991; Wesseling *et al.*, 1997; Eddleston *et al.*, 1998; Eddleston, 2000; Yusuf *et al.*, 2000; Ecobichon, 2001; Gunnell & Eddleston, 2003; Eddleston & Phillips, 2004; Srinivas Rao *et al.*, 2005; Bertolote *et al.*, 2006 a & b).

A review by London and colleagues (2005) indicated that most epidemiological research on DSH and suicide with pesticides in low-and middle-income countries are based on hospital or clinical data. Such clinical data, however fails to consider many aspects of the problem associated with pesticide use in the community. Hospitalisation of patients with intentional pesticide ingestion depend on a number of factors, including access to treatment, seriousness of the attempt (Keifer *et al.*, 1996), gender, social stigma and the type of poison ingested. Clinic based data tells only part of the story; they typically summarise demographic features of cases, and sometimes psychiatric and medical risk factors. They rarely consider contexts, motivations, or the easy availability of means for suicidal behaviour (both non-fatal DSH and suicides). Community studies are needed in order that complementary community and hospital studies may guide strategies for suicide prevention (Silverman & Maris, 1995; US Dept. of Health & Human Services, 1999; Bertolote, *et al.*, 2003; Knox *et al.*, 2004).

In the course of developing a community mental health research in the Sundarban region of India, various segments of village communities expressed concerns about suicidal behaviour, focussing on pesticide ingestion (Chowdhury *et al.*, 2003; Chowdhury & Weiss, 2004; Chowdhury *et al.*, 2005a). Acknowledging the problem and responding to the requests from the community, a programme for preventing suicidal behaviour in the region that combined research, clinical services, and community interventions was developed.

As a part of this effort, a household survey was conducted in 1,680 households on an island of the Sundarban region. This cross-sectional study assessed household reports of pesticide

practices and use of pesticides and other methods for suicidal behaviour in the community. The survey also assessed accidental poisoning and the level of awareness among farmers about the safety, storage and ill-effects of pesticide use.

Methods

Study setting

Since the partition of the Indian subcontinent in 1947, one-third of the Sundarban region lie in India and the remaining in Bangladesh, and it is the largest tidal, halophytic (Halophytes are plants that grow in saline soil) mangrove delta of the world (Naskar & Bakshi, 1987; Naskar, 1998). The Indian Sundarban region is located at the southernmost tip of the state of West Bengal. On the west it is bounded by the Hoogly river, on the east by the Ichamati-Kalindi-Raimangal rivers, on the South by the Bay of Bengal and on the North by the imaginary Dampier-Hodges line (The Dampier-Hodges line was drawn by two colonial bureaucrats, Dampier and Hodges, who delineated the region as a special forest area in 1822) (Das, *et al.*, 1981). The region comprises both island and mainland community development blocks (CDBs), which are the lowest level of administrative unit of a district in a rural region.

Namkhana is one of the Island CDBs of the Sundarban region. It is situated 105 kilometres south of the state capital, Kolkata (formerly Calcutta), and covers an area of 227 square kilometres. The total population of the region is 160,627 (Census, 2001). Seven Gram Panchayats (GPs), or local self-government organisations govern 34 villages of Namkhana block. Two rivers, the Hatania-Doania and Chinai, trisect the region into three distinct geographical units.

For this study three villages from each of the seven GPs were selected to represent a range of ecological and demographic conditions within the administrative CDB of Namkhana (Fig. 4.1).

Sample size calculation

Prior to this study, no community research on suicidal behaviour had been conducted in this area. Absence of prior knowledge of sampling parameters made the sample size computation for a community survey with responses on a sensitive issue as DSH and suicide difficult. In order to guide sample size calculation and to pre-test the survey instrument a pilot survey was conducted in all the households (n=214) in Lakshmipur Abad, a village, presenting ecological and demographic characteristics similar to the other villages of Namkhana (Chowdhury *et al.*, 2005b). The primary purpose of the instrument was to gather information about any events of non-fatal DSH carried out by any of the family members within the past 5 years that were known to the informant. People who died as a result of a DSH event were classified as suicides. Poisonings of children less than ten years of age were considered to be accidental poisoning. Recall period was 5 years. Fifteen (7.01%) households reported DSH cases in the pilot study.

Considering the prevalence rate from the pilot study, with a $\pm 2.0\%$ margin of error and setting the confidence interval at 99.9% the sample size, was computed to be 1,680 households out of 30,000 households distributed among 7 GPs of Namkhana CDB. A mixed multi stage random and cluster design was followed for the purpose of the survey on DSH from the households. A two stage cluster sampling technique regarded villages as the first cluster and households as the second clustering unit. Household was defined as people sharing a common kitchen. These households were drawn up from the Household Register of each village, which was collected from the Block Development Office (BDO) and numbers were assigned to households. Three villages were randomly chosen from each GP. Thus, 21 of the 34 villages of the Namkhana block were selected randomly. This was done to allow equitable representation to each GP. Distributing 1,680 households among the 21 selected villages required 80 households (calculated 79.3%) to be interviewed per village, and these households were selected from a computer generated random number list. For every village, extra 25.0% households were generated from the random list to provide substitutes for unavailable households. The study design thus reduced to a mixed random and cluster design with the household as the study unit.

The pilot study indicated that agriculture was carried out mostly by men but, women who, were involved, had a more passive role in using pesticides and offered very little information on pesticide practice. Women, in the region were mostly not allowed to be involved with pesticides because they are considered to be physically unfit to handle pesticides and the community expressed

concerns about the effect of the pesticides on the reproductive health of women. Thus, it was decided that only an adult male (minimum 18 years) would be interviewed for the household survey. If, during the actual household survey, a selected household had no adult male member, that household would be skipped and the next household on the random number list would be considered for survey.

Survey Instrument and data collection

A survey schedule (Household Information on Pesticide Use and DSH) was designed to elicit qualitative and quantitative information of agricultural practice, pesticide use and accidental poisoning and DSH from the study households. The 14-item questionnaire began with a short introduction describing objectives of the study and purpose of the interview, followed by questions about demographic information of respondents, including age, level of education and occupation of the informant. The first three questions pertained to land holding and agricultural practice of the household. Questions 4-11 addressed the issue of household chemical use, pesticide use, pesticide storage, respondents' and investigators' opinions about safe pesticide storage and type of shop from which pesticides were purchased and knowledge about ill-effects of pesticide on crops and human health. The investigators' criteria for safe storage of pesticides were if they were kept in a locked box and in a confidential place known only to the respondent or household head and out of reach of both children and other members of the family. The last three questions focussed on accidental poisoning and suicidal behaviour (DSH and suicide) with pesticides and with other agents. These three questions further aimed to clarify the age, hospitalisation, sex, outcome and reasons of persons indulging in suicidal behaviour. Recall period of any self-harm event was 5 years. There was an additional section for investigator to record personal comments. Informed consent was obtained before each interview. The instrument was pre-tested during the pilot survey and altered based on experience and recommendations from the community. The modified instrument was used for the main survey. Data were collected from May 2002 to April 2003 by the first author (SB) and six research assistants who were supervised by the first and second authors (SB, ANC).

Data analysis

Data were entered in Microsoft Access and analysed with Stata (Intercooled Standard

version 8.0). Descriptive analysis of various explanatory variables was done for example age, level of education, primary occupation, types of crops cultivated, household chemical and pesticide use, pesticide storage, knowledge about the ill-effects of pesticide on crops, on health and events of suicidal behaviour. While the Kappa statistic was computed to measure the level of agreement between the respondents and the investigators about the safe storage of pesticide, the McNemar's Test was used to assess the association between the two responses. The analysis was done on a subset ($n=1,221$) of the study population who stored pesticides. Community rates of DSH and suicide with pesticide exclusively and all means, including pesticides were calculated.

Results

A total of 1,680 households were surveyed in the 21 villages of Namkhana Island. The median age of the respondents was 42.5 (range 18-90 years std. dev. \pm 13.9). Most (44.5%) of the respondents had secondary level (standard V to standard XII) education followed by 26.8% of the respondents who had primary education (standard I to standard IV); 6.0% of the respondents reported that they had education higher than secondary level and the rest had no education. Respondents often had more than one occupation. They could specify a primary occupation, based on their principal source of earning. The three primary occupations reported most frequently were farming (41.5%), daily labour (22.1%) and fishing (16.4%).

A total number of 1,236 households (73.6%) reported possessing agricultural land. Most households cultivated more than one crop. The crops commonly grown by the households were paddy (81.7%), chilli (*Capsicum annuum*) (48.3%), betel leaf (*Piper betle*) (20.8%) and vegetables. A few households also cultivated watermelon and sunflower.

All households reported using kerosene, a household chemical, since electricity was still not available to most villages and kerosene lamps were the main source of light. Majority of the households used pesticides for agricultural purposes (72.7%) and 31.5% of the 444 households not possessing agricultural land reported using pesticides. Of the 1,221 households using pesticides, 46.3% of the households reported storing pesticides inside the house and only 8.2% households did not store pesticides, but used it immediately after purchase. Pesticides were stored outside the house by 22.4% households while 70 households kept them both inside and outside the house.

A total of 169 households (9.9%) reported 181 incidents of suicidal behaviour, of which,

136 were DSH (75.1%) and the remaining suicides were reported over a period of five years. The most commonly used methods in suicidal behaviour were pesticides (68.0%) followed by indigenous poisons (18.2%), hanging (8.3%), burning (2.2%) and other methods. Pesticides were the most frequently reported method adopted for both DSH and suicide. Hospitalisation was done on 108 occasions (59.7%), most of which were for pesticide ingestion (72.2%), 25.0% for indigenous poisons, only three for burning one for and hanging. The two most frequently reported reasons for suicidal behaviour were quarrel with spouse (53.8%) and other family members, including in-laws, parents, siblings, children (19.0%). Wide spectrum of issues ranging from extramarital relations and physical abuse to parental retribution for smoking was identified as the various dimensions of family conflict by the community. The associated problems of alcohol abuse were also mentioned in a few instances. Table 4.1 shows the distribution of pesticides storage inside and outside the household. Respondents mainly expressed concerns about the safety of children and thus more than three-quarters of the households reported storing pesticides in places that were out of reach of children. Only 27.3% of the households had provisions for storing pesticides in a locked box and 29.3% in a confidential place. Here, the term 'confidential' was used to indicate a place which, only the person primarily engaged in agriculture was aware about. Most of the 344 respondents (61.9%) who reported storing pesticides outside the household, stored it in the agricultural field, under the soil. One person reported storing it on a tree beside a neighbour's pond. He expressed concerns about storing it in the field, fearing theft. He said that it was too risky to keep it in the field and devised his own way of storing the pesticide. At the same time he expressed concerns about storing it at home.

Table 4.1: Distribution of pesticide storage (n=1,191*)

Inside the house (n=847)	Yes	%	No	%	Outside the house (n=344)	Yes	%
Locked Box	232	27.3	615	72.6	Within the courtyard	111	32.3
Confidential	248	29.3	599	70.7	In the agricultural field	213	61.9
Out of reach of children	643	75.9	204	24.1	Other	20	5.7

* Table includes the 70 households that store pesticides both inside as well as outside the house

Table 4.2 shows the level of agreement between respondents and investigators regarding safety of pesticide storage. Of the 1,221 respondents, 1,074 (87.9%) judged their storage arrangement to be safe, but, the investigator considered 480 (39.3%) of these to be safe. Only on three occasions

did the investigator consider storage to be safe when the respondent perceived it otherwise (0.6%). There was poor agreement between investigator and respondent on 1,221 responses on pesticide storage ($\kappa^2=0.16$). The McNemar's test ($p < 0.000$) indicated there was an association between the responses of the respondent and the investigator. There was a bias in the sense that the investigator tended to agree more with the respondents on the issue of unsafe storage of pesticides and inclined to disagree with the farmers who thought their pesticides were stored safely.

Table 4.2: Level of agreement between respondent and investigator on the issue of safe storage of pesticide (n = 1,221)

Respondent Assessed	Investigator assessed				Total	
	Safe	%	Unsafe	%	N	%
Safe	480	99.4	594	(80.5)	1,074	(88.5)
Unsafe	3	(0.6)	144	(19.5)	147	(12.0)
Total	483	(39.5)	738	(60.4)	1,221	(100.0)

Of the 1,221 households interviewed, only a little more than a quarter respondents had any information about the ill-effects of pesticide use on crops. In comparison to the knowledge about the ill-effects of pesticide use on crops, they were more aware about its adverse impact on health (37.0%). They gathered information primarily through their own experiences and from other farmers. The agriculture department and GPs played very little role in the dissemination of information about the side-effects of pesticide use (Table 4.3).

Table 4.3: Sources of information about ill-effects of pesticide on crops and health as reported by households using pesticides (n=1,221)

Sources of information	Crops n=320 (26.2%)*	Health n=452 (37.0%)*
Agricultural department	27(2.2)	22 (1.8)
Fellow farmer	113(9.3)	238 (19.5)
Media	25 (2.0)	39 (3.2)
Gram Panchayats	1 (0.1)	3 (0.2)
Personal experience	218 (17.9)	287 (23.5)
Pesticide company	9 (0.7)	15 (1.2)
Pesticide shop	63 (5.2)	106 (8.7)
Others	8 (0.7)	9 (0.7)

*Percentage is with reference to households using pesticides (n=1,221)

** Individuals responded to more than one category

Farmers reported that the block agricultural department assigned an agricultural advisor for each GP, who is commonly referred to as KPS (*Krishi Prayukti Sahayak*) but he provided no assistance. The KPS is supposed to visit each village twice a month to inform farmers about newer methods of cultivation in order to increase crop production, answer their queries, promote safe pesticide practice. However, he is rarely to be seen and as a farmer summed up

I have been cultivating for the last 20 years. Earlier, the KPS used to visit us regularly but, since the last 5 to 10 years he is rarely to be seen. The only day he is around is when he has to collect his salary from the block agricultural office at the end of the month.

Another finding was related to the awareness of danger in larger doses, but, failure to appreciate the risk of small doses or exposure to pesticide.

The overall annual rates for DSH and suicide in Namkhana were very high. The suicide rate was eight times higher than the national average of 10.6 per 100,000 people. The pesticide-related annual DSH and suicide rates were 158.1 (95% CI 126.2-195.5) and 73.4 (95% CI 52.2-100.3) per 100,000 population. Both DSH and suicide rates were higher in women than in men (Table 4.4).

Table 4.4: Annual overall and pesticide-related DSH and suicide rates per 100,000 population

Items	All means (including Pesticide)			Pesticide		
	Female	Male	Total	Female	Male	Total
Population	78326	82301	10627	78326	82301	10627
DSH (n)*	94	42	136	51	33	84
Rate**	24.0	10.2	256.0	13.0	8.0	158.1
(CI)***	(19.4-29.4)	(7.4-13.8)	(215.0-302.4)	(9.7-17.1)	(5.5-11.3)	(126.2-195.5)
Suicide (n)*	25	22	45	23	16	39
Rate**	6.4	5.3	84.7	5.9	3.9	73.4
(CI)***	(4.1-9.4)	(3.4-8.1)	(61.8-113.2)	(3.7-8.8)	(2.2-6.3)	(52.2-100.3)

*n= number of events in 5 years

**Rate is calculated per year

***The confidence interval is set to 95.0%

Discussion

This community based epidemiological study highlighted four important findings notably the issue of pesticide storage; lack of knowledge about safe pesticide practice; the interactions between pesticide practice and suicidal behaviour and the high DSH and suicide rates in Namkhana CDB of the Sundarban region.

Pesticide storage

Most households stored pesticides at home and in a way that was considered to be safe by the respondents, but unsafe in the opinion of the investigator. Unlike in industrialised countries, most farmers in low-and middle-income countries cultivate small areas of land and live in a single or two roomed huts and this is true also for farmers in Namkhana. Most farmers do not have the financial capacity to build a separate room to store pesticides. Thus, they are compelled to store it either in the living quarters or in the agricultural field. Studies in Sri Lanka and China have reported farmers store their supplies of pesticides within or near the household (Abeyasinghe, 1992; Phillips *et al.*, 2002a; Gunnell & Eddleston, 2003). However, most farmers preferred to keep the pesticides at home, in cartons, open shelves in the wall or tucked away in a tile on the roof (Fig 4.2). The reasons they cited

were that most farmers were poor and some of them could not afford cupboards or locked boxes. Pesticides are expensive and hiding it in the agricultural field was considered to be unsafe as they may be stolen. Furthermore, rain water could seep into the container and render the pesticide unusable. While they expressed personal concerns about storing them in the fields, they totally ignored the environmental hazards such as soil contamination from spillage.

Fig.4.2: Unprotected storage of pesticides



The farmers considered pesticides to be stored in a safe manner if they were kept out of reach of children, but with little regard for the safety of other members of the family. Farmers added that it was impossible to keep pesticides in locked boxes or in a confidential place out of reach of other members of the family because they were sometimes actively involved in agricultural activities. Moreover, some farmers who were also involved in fishing said that another member of the family had to spray pesticides while they were away and they had to know where the pesticides were stored. Although, most farmers are poor and cannot afford to purchase separate cupboards or locked boxes for storing pesticides, those who did have cupboards or locked boxes stored their pesticides along with other belongings such as clothes. Some farmers mentioned that during the farming season, they are frequently required to spray pesticides, and is inconvenient for them to store pesticides away in locked cupboards or boxes. These factors argued against safe pesticide storage recommended by national and international agencies.

Lack of knowledge about safe pesticide practice

Most respondents reported that they were unaware of the ill-effects of pesticide use, either on health or on the environment. For those who did report knowledge about the negative effects of

pesticide use, knowledge came primarily from their own experience or those of fellow farmers. They openly declared that pesticide shop owners and aggressive advertising by pesticide companies highlighted only the positive impact of pesticide use, but, not their harmful effects. The agricultural department and the GPs in Namkhana had little or no role in educating the farmers about safe pesticide practice.

Though many of farmers reported experiencing physical discomfort while using pesticides such as symptoms of nausea, irritation in the eyes and skin, they did not seek medical help. A common notion the farmers held was that drinking tamarind water would relieve nausea. A few farmers exhibited a nonchalant attitude when they declared that they opened the pesticide container with their mouth and some of them said they tasted it before applying it on the plants. These findings reflect their inadequate knowledge of pesticide hazards and the need to promote awareness of safe pesticide practice and storage. Studies on farm workers' knowledge about the effect of pesticide use conducted in Florida (Flocks *et al.*, 2007), North Carolina, USA (Quandt *et al.*, 1997) and Nueva Ecija, Philippines (Palis *et al.*, 2006) reported similar findings.

Pesticide practice and suicidal behaviour

This study, similar to other studies found that patients using pesticides for DSH were taken to the hospital while those using other methods were not (London & Bailie, 2001; Murray *et al.*, 2002; London *et al.*, 2005). Reliance on clinical data alone may overestimates self-harm with a particular method, pesticides, as found in this study while, unerringly overlooking the influence of other methods used in DSH and suicide. Hence, a community study, juxtaposed with clinical research on DSH may yield a more complete picture of the problem in a community and thereby help in designing an effective intervention to prevent suicidal behaviour.

This study found quarrel with spouse and other family members prompted the suicidal behaviour. There is a need to sensitise the local community about the typical psychosocial contexts in which suicidal behaviour occur and to encourage community support to assist those who are vulnerable to involve themselves in suicidal behaviour. The insights developed during the course of this community survey help to understand the local context and situation which need to be taken into account in order to design an effective strategy for DSH and suicide prevention suited to the particular needs of the community (Chowdhury *et al.*, 2003).

High rates of DSH and suicide

Few studies have identified rates of non-fatal DSH either globally or at a national level. This study has made one of the earliest efforts to document non-fatal DSH rates in an Indian community. This study reports high rates of female suicide, higher than their male counterparts (Phillips *et al.*, 2002b; Aaron, 2004; Ahmed *et al.*, 2004). This finding is contrary to global findings where more men die by suicide and more women attempt DSH (Cantor, 2000). This may have some relation to the substances consumed in self-harm (Gunnell & Eddleston, 2003) and the disadvantage of female gender roles that contributes to the vulnerability of women in low-and middle-income countries, particularly young married women which account for differences in mortality. The agents used in self-harm overdose in high-income settings are typically prescribed or non-prescription drugs that are less toxic than lethal pesticides. From a very young age, the patriarchal systems in low-and middle-income countries inculcate in women the belief that they are submissive, docile, timid, and in general, subordinate to men within and outside the household. Traditional Indian marriages require a new bride to live with her husband's family, especially in rural areas. She is expected to take on numerous responsibilities and is often held responsible and blamed for conflicts within the household. Amidst the hostile environment they feel helpless and fear losing their husband's sympathies. They opt for self-harm as a way of putting an end to psychological pain and misery (Venkoba Rao *et al.*, 1989; Ahmed *et al.*, 2004). Findings from this study indicate a serious problem confronting the society in Namkhana, as in many low-and middle-income countries, namely, gender-based inequality. To address this issue and bring about a change in the social position of women in Namkhana require initiatives in various spheres of life. Strengthening legislative measures in favour of women, education and developing better coping skills when faced with negative life situations are just a few ways by which this may be achieved.

The findings of this study are also contrary to global trends which consider DSH to be 10 to 20 times more common than suicide (Bertolote & Fleischmann, 2002). DSH events as reported in this study were approximately 4 times more than suicide rates. Further research is warranted on this issue in order for this finding to be generalised.

Limitations of the study

The rates of suicidal behaviour have to be interpreted with a certain degree of caution considering that the recall period of DSH and suicide was 5 years. It was not possible to cross check the information on suicidal behaviour provided at the household level. However, this limitation will continue to exist in view of the socio-economic and educational canvas of the population.

The interpretation pertaining to storage of pesticides by the respondent was subjective which lead to a difference with regard to the assessment by the interviewer. As a result the extent of agreement which was also calculated was poor. The assessment was nevertheless based on recommendations for safe storage, and it was usually clear, rather than ambiguous, lending validity to the findings.

Conclusion

Intersectoral programmes are needed to link the interests of the agricultural sector, the GPs, the health sector and the community to prevent DSH and suicide in Namkhana block, as well as the morbidity and mortality of accidental pesticide poisoning. The role of the agricultural department would typically include promotion of safe pesticide practice, train farmers in alternatives method of pesticide use such as Integrated Pest Management (IPM), generating awareness to purchase limited quantities of pesticide- the required amount only and improve storage facilities, promoting awareness about the positive as well as negative impacts of pesticide use on crops, health and environment regulating and supervising sale of pesticides in the region, encouraging farmers to visit health centres in case of occupational exposure. The GP has an important role to play in regulating and supervising the sale of pesticides in the block, coordinating with the agricultural department its various activities and ensuring the KPS performs his regular duties and in encouraging supports to those vulnerable to indulging in suicidal behaviour.

The health department should contribute to reducing the morbidity and mortality of pesticide poisoning — whether accidental and intentional — by making cheap antidotes available in the community, improving treatment. Preventing suicide and managing suicidal behaviour also requires sensitising the public to questions about recognising mental illness, which constitutes an important component of suicide prevention, and to recognise the typical socio-cultural contexts in which pesticides

are consumed (Chowdhury & Weiss, 2004). This study recommends similar studies be conducted throughout India and elsewhere for suicide prevention and community mental health to distinguish common and distinctive features of suicidal behaviours that local programmes should be aware of.

This community household survey examined practical features and contexts of suicide well beyond rates and psychiatric diagnosis. Findings highlight the need for intersectoral programmes that combine activities to minimise pesticide hazard and recognise the typical contexts in which DSH and suicide occur.

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Chapter 5

Intersectoral community actions for preventing pesticide-related deliberate self-harm and suicide in the Sunbarban region, India

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Introduction

Throughout India, research suggests that suicidal behaviour, both non-fatal deliberate self-harm (DSH) and suicide, particularly with pesticides is a major public health problem.¹⁻²⁰ But, in some areas the problem is more serious. In 2001, the state of West Bengal, one of India's 28 states, reported a suicide rate of 17.1 per 100,000 people which was higher than the national average of 10.6 and intentional pesticide ingestion accounted for an estimated 10.4% of the 13,690 suicides.²¹ During a community survey of local priorities for mental health in the Sundarban region of West Bengal, suicidal behaviour was acknowledged locally as a problem.²² Responding to the needs of the local community in the Sundarban region, a DSH and suicide prevention programme was developed on the Namkhana Island of the Sundarban region. The programme was based on the Operational Model²³ that concentrates on intervention rather than on causality or etiology and suggests three varieties of intervention to prevent suicidal behavior viz., universal, selective and indicated strategies or procedures.

Universal prevention considers the entire population; selective prevention focuses on high risk groups, and indicated prevention concerned with persons who have a particular risk based on their behaviour, history or declaration. Selective and indicated are the most used approaches and are guided by clinic-based data that reflect professional perspectives where the individuals identified at risk have little role to play in the development of suicide prevention programmes.²³ However, the universal model, which is a less commonly used approach, focuses more on community involvement for suicide prevention programmes and is being recommended by experts in the field of suicide study.²⁴⁻²⁷

This study adopted the universal approach, of the OM²³ which, is based on the tenets of Public Health²⁸ to address the issue of DSH and suicide on the Namkhana Island of the Sundarban region, India.

Methods

Study Area

The Sundarban region is the largest delta in the world, formed as various rivers emerging from the River Ganges flow into the Bay of Bengal. Forty percent of this region is in India and the rest in Bangladesh. The Indian part of the region covers an area of 9,630 square kilometres and is located at the southern-most tip of the state of West Bengal.²⁹ The region comprises both island and mainland community development blocks (CDB), which is the lowest administrative unit of a district in a rural

region. The block has a definite geographical boundary and the average population is between 150,000 and 200,000.

Namkhana, one of the island CDBs, is situated in the western part of the Sundarban region, covers an area of 227 square kilometres, and has a total population of 160,627.³⁰ The 34 villages of Namkhana are governed by seven Gram Panchayats (GP), or locally elected administrative bodies. Namkhana is one of the underdeveloped and underserved CDBs of the region with very poor transport and communication facilities, limited supply of clean drinking water, insufficient electricity, and inadequate health services.³¹

Agriculture is the primary occupation for majority of the people of Namkhana.³² Farmers use large quantities of fertilisers and pesticides to increase crop yields. They store these toxic chemicals indiscriminately in their home. The easy availability of pesticides in most households leads to accidental poisoning among children and DSH and suicide in adults including occupational exposure.⁶

Any measure to prevent pesticide poisoning and promote health should incorporate the views of the local community in order for the programme to be effective.^{18,33,34} Considering this, the present research was undertaken with the objective of identifying community perceptions about the problem of DSH and suicide, especially due to intentional pesticide ingestion. Identification of local concepts and ideas that could guide suitable methods for community interventions to prevent DSH and suicide in general and with pesticides in particular were sought. We aimed to acquire experience with the ideas for community action for suicide prevention and mental health promotion through this intersectoral community participatory research.

Field work was conducted over a period of one year and seven months, from January 2001 to July 2003 in all villages of Namkhana.

Data Collection

Preliminary field visits identified community groups with interests and potential involvement in interventions for DSH and suicide prevention. This article reports findings from interactions with three such groups: farmers, pesticide shop owners, and members of the local administrative governing committees, GPs. The rationale for selecting these three groups were: farmers and pesticide shop owners deal directly with pesticides and GPs are the overall administrative and most powerful political organisation in the villages, influencing the lives of the residents. The opinions, risk perception and suggestions of these three groups were crucial for planning an intervention for preventing DSH and

suicide, particularly with pesticides.

Sample

All pesticide shop owners were sent invitation letters in advance requesting a meeting at a specified date, venue and time. The research team made a second visit to reconfirm their participation. The same procedure was followed for the GP members. However, farmers were recruited differently. The GP helped to identify a group of farmers who were then contacted by the research team and to participate in a group discussion. Farmers, who could voice their opinions, possessed leadership qualities and could influence their peers, were identified.

A total of 30 farmers, 11 pesticide shop owners and 124 GP members attended the FFGDs. Four such FFGDs with farmers, three with pesticide shop owners, and eight with GP members were conducted.

(Fig. 5.1: ANC & MGW supervising an FFGD)



Facilitated Focus Group Questionnaires and Discussions

A modification of traditional focus group discussion methods was used among the three groups. The modified focus group discussions are referred to as facilitated focus group discussions (FFGDs), because the discussion was facilitated by introducing the topic with a group-specific questionnaire that participants were asked to complete, helping to focus their attention on the topic at the onset (Fig. 5.1). The primary focus of the meetings with the three groups was DSH, suicide and pesticide poisoning. Signs and symptoms of common mental illnesses were also discussed in some

group meetings. After introducing the topic, a short questionnaire was distributed to the participants.

Farmers' Questionnaire: A ten-item questionnaire on agriculture-related-practice was developed which addressed the issues of land holding, pesticide use, storage, knowledge about the ill-effects of pesticide use on crops and health, incidents of deliberate poisoning in their households and perceptions of DSH and suicide with pesticide in the community, the priority of these problems, and suggestions about the possible measures of prevention.

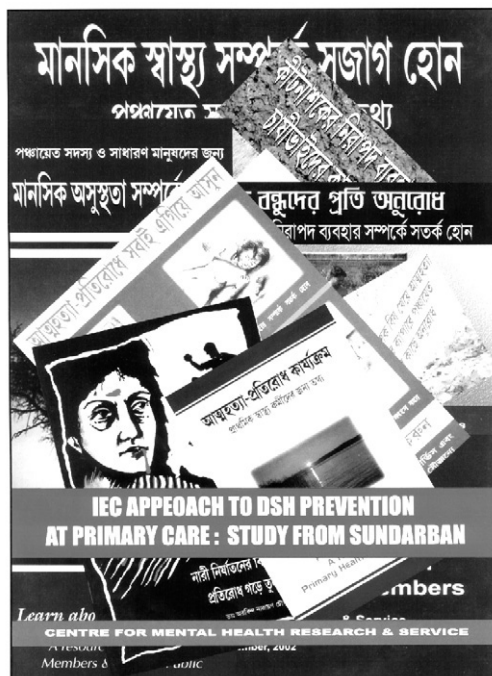
GP members' Questionnaire: This consisted of nine questions on issues relating to mental health, DSH and suicide, and information about pesticide shops. They were also queried about GP arbitration in family disputes and conflicts that had culminated in either DSH or suicide.

Pesticide shop-owners' Questionnaire: It included ten questions on topics such as governmental regulation regarding sale of pesticide, precautionary measures adopted by the shop owners while selling pesticides, interaction between pesticide shop owners, pesticide companies and consumers and perceptions about DSH and suicide with pesticides and suggestions for its prevention.

All three questionnaires were designed in the local language Bengali and began with a short introductory statement about the purpose of the meeting and ended with space provided for recording participant sociodemographic information. The questionnaires were pre-tested during a pilot survey among two groups of farmers and two groups of GP members in two separate CDBs in the Sundarban region. The instruments were modified and the final version was used for the main survey. The FFGDs were led by the primary investigator (ANC). An observer (usually the second author) made notes of non-verbal communication and maintained minutes of each meeting. Proceedings of the FFGDs were recorded after obtaining the participants' informed consent. Transcriptions were made in Bengali and later translated into English. No incentives were offered and no obligations were imposed on the participants. All meetings were conducted in Bengali the local language.

First, the analysis of questionnaire data helped to develop insight about the group-specific perceptions and opinions about pesticide-related self-harm on the island. Second, based on their requests, suggestions and the priorities for mental health interests, suicide prevention and safer use of pesticides, a strategy for community action was formulated. The community also requested for training and information on the issue. Through community participation, IEC (information, education and communication) materials for training and awareness generation such as banners, books, pamphlets, and posters were developed and disseminated to each target group (Fig. 5.2).

Fig. 5.2: IEC materials: a collage



Results

Farmers' FFGDs

Table 5.1 summarises findings from the farmers' FFGDs. Maximum farmers (53.3%) store pesticides at home and among these in 31.3% homes, it is kept open. Nearly three quarters of the farmers (73.3%) purchase pesticides a week before the use. So far as the knowledge of ill effects of pesticides, 36.7% had no knowledge on its ill-effects on crops, 53.3% had no knowledge on its deleterious impact on the environment. Majority of the farmers had experienced discomfort of some sort while spraying pesticide, the most common distress mentioned being head ache (42.9%). Self-harm by pesticide ingestion was acknowledged to be a problem in Namkhana by 76.7% of the farmers. More than half of the farmers believed that self-harm by pesticide consumption could be reduced by adopting appropriate programmes such as public awareness generation (65.2%), farmers' training

(30.4%) including safe storage of pesticides and reducing domestic violence.

In the discussion that followed, the farmers discussed and elaborated some of these and other points. Analysis of the farmers' discussion indicated most participants were not aware of the guidelines of safe pesticide practice recommended by national and international agencies. Most respondents reported that they were unaware of the ill-effects of pesticide use, either on health or on the environment. For those who did report knowledge about the negative effects of pesticide use, knowledge came primarily from their own experience or those of fellow farmers. The farmers reported that the agricultural department, pesticide shop-owners and pesticide companies were not actively involved in the dissemination of information of pesticide use. They requested for more support from the GPs and agricultural department in matters relating to pesticide use in crop cultivation. They also added that many spurious and banned pesticides were being marketed in Namkhana.

Few farmers perceived pesticides as a risk. On the topic of unsafe pesticide practice, one such farmer reported

“Farmers here are not aware about the dangers of pesticide use. I have seen some of my neighbours opening the seal of the pesticide container with their mouth. In fact, some of them even put it on their tongue to see if it is bitter, an indication, in their opinion, that the product is genuine.Many women in our locality mix these pesticides with hair oil and use it as a lice killer.”

Table 5.1: Farmers' responses on pesticide practice and DSH

Questions	N	%
1. Does the subject possess own cultivable land?		
Yes	30	100.0
2. Does the subject use pesticides for cultivation?		
Yes	30	100.0
3. Storage of pesticides: Where?	30	100.0
Ai. Indoor	16	53.3
Locked box	7	43.8
Open box	8	50.0
No box	1	6.3
3Aii. Whether stored in secret place?	16	100.0
Yes	11	68.8
No	5	31.3
3Aiii. Whether stored out of reach children? (Yes)	16	100.0
3B. Outside	8	26.7
Boundary of the house	3	37.5
Agricultural field	3	37.5
Other	2	25.0
3C. Both places	5	16.7
Whether stored in secret place? (Yes)	5	100.0
Out of reach children? (Yes)	5	100.0
3D. Immediate use	1	3.3
4. Type of pesticide shops	30	100.0
Licensed	20	66.7
Don't know	10	33.3
5. Generally who buys the pesticide from the shop?	30	100.0
Self always	22	73.3
Others sometime	7	23.3
Others always	1	3.3
6. How many days ago is the pesticide purchased?	30	100.0
Before use	1	3.3
One day	4	13.3
2 to 7 days	22	73.3
More than 7 days	3	10.0
7A. Knowledge of ill effect of pesticides on crops	30	100.0
Yes	19	63.3
No	11	36.7
A. Source of knowledge	19	100.0
Pesticide company	1	5.3
Pesticide shop	6	31.5
Agriculture Department	4	21.1
Farmers	8	42.1

Questions	N	%
8. Knowledge of ill effect of pesticides on environment	30	100.0
Yes	14	46.7
No	16	53.3
A. Source of knowledge	14	100.0
Pesticide company	1	7.1
Pesticide shop	3	21.4
Agriculture Department	5	35.7
Farmers	5	35.7
9a. Experience discomfort while spraying pesticide?	30	100.0
Yes	22	73.3
No	8	26.7
9b. Description of discomfort (individuals mentioned multiple symptoms)	22	100.0
Breathing difficulty	2	9.1
Burning sensation	6	27.3
Headache	14	63.6
Loss of appetite	2	9.1
Reeling sensation	4	18.2
Weakness	7	31.8
Other	4	18.2
10a. Is self-harm by pesticide consumption a problem in the region?	30	100.0
Yes	23	76.7
No	7	23.3
10b. If yes, describe methods to prevent it (individuals mentioned multiple symptoms)	23	100.0
Generate Public Awareness about the problem of self-harm by pesticide ingestion	15	65.2
Farmers' Training	7	30.4
Develop alternatives to pesticide use	2	8.7
Safe storage of pesticides	5	21.7
Reduce domestic violence and mental torture	2	8.7

Pesticide Shop-owners FFGDs

In the FFGDs with the pesticide shop owners (Table 5.2), 45.5% reported that they were not aware about any governmental policy regarding pesticide sale. Most (63.6%) pesticide shop owners reported taking some precautionary measures while selling pesticides. The most frequently reported safety method adopted by the pesticide shop owners was not to sell the product in case there was doubt about the consumer's intentions to use pesticides other than agricultural practice.

Many pesticide shop owners (63.6%) acknowledged that they rarely gave out any instructions

about pesticide use to their clients and majority (72.7%) added that they did not provide any protective materials such as gloves or goggles to their clients. Most small pesticide outlets did not deal in large quantities of pesticide and therefore, shop owners had limited access to this type of protection. Pesticide shop owners reported distributing these limited number of protective accessories among their clients who made bigger purchases.

Nearly all shop owners (90.9%) said they did not provide any information about the harmful effects of pesticide use to farmers. Only 18.2% of the shop owners reported that a pesticide company organised a training programme for them. Majority (81.8%) of the participants agreed that deliberate pesticide ingestion was a problem in the region. Only two participants thought something could be done to reduce morbidity and mortality while the remaining did not know what could be done.

In the discussion, one shopkeeper mentioned his own ignorance and inability to communicate the adverse effects of pesticide use to the farmers. When asked if the agricultural department played a supervisory role one pesticide shop owner said,

"There are separate licenses for fertilisers and for pesticides. Most shops have license to sell fertilisers but, not pesticides. When shop owners say that they possess license, they imply fertiliser license. There are more than 250 pesticide shops in the entire island and only 4 possess valid license to sell pesticides.the agriculture department usually informs us in advance that an officer was coming to inspect. However, once there was a surprise visit in one of the shops and the officer came to check if the shop owner had a valid license. His license had expired and so the officer closed down his shop. But, he opened it after a few days. I think he must have paid some money to the officer. Since then, all shop-keepers have become cautious. Once they came to my shop but, I presented false accounts, so, nothing happened." There is lack of regulation and supervision by the agricultural department and the GPs on the sale of pesticides. Pesticide companies do not provide information to pesticide shop-owners about safe pesticide practice. Many of the shop-owners were aware about the problem of intentional pesticide poisoning in Namkhana."

During the discussions, the pesticide shop-owners suggested that fertiliser and pesticide licenses be combined as one and be made easily available. They also recommended that the validity of pesticide licenses be extended from one year to five years.

Table 5.2: Pesticide shop owners' responses on pesticide practice and DSH

Questions	N	%
1. Are there any governmental rules and regulations regarding pesticide sale in Namkhana?	11	100.0
Yes	6	54.5
Don't know	5	45.5
2A. Do you take any special care while selling pesticide?	11	100.0
Yes	7	63.6
No	4	36.4
2B. If yes, what special care do you take?	7	100.0
In case of any suspicion, pesticide is not sold	5	71.4
Sell pesticides only to male adults	1	14.3
Enquire about the purpose before selling pesticides	1	14.3
3. Is the process of use and application of pesticide always explained to the consumer?	11	100.0
Yes	4	36.4
No	7	63.6
4. Are consumers provided with any protective materials (gloves, masks) when buying pesticides?	11	100.0
Yes	3	27.3
No	8	72.7
5. Are consumers informed about the harmful effects of pesticide when buying pesticides?	11	100.0
Yes	1	9.1
No	10	90.9
6. In the past one year were you ever suspicious about the intentions of any consumer buying pesticide?	11	100.0
Yes	4	36.4
No	7	63.6
7. Has any pesticide company ever organised farmers' training on pesticide use in Namkhana?	11	100.0
Yes	2	18.2
No	9	81.8
8. As pesticide shop-owner have you attended any training organised by pesticide companies on safe pesticide practice?	11	100.0
Yes	2	18.2
No	9	81.8
9. Do you consider self-harm by ingesting pesticides a problem in Namkhana?	11	100.0
Yes	9	81.8
No	2	18.2
10a. Can anything be done to reduce and prevent self-harm by pesticide ingestion?	11	100.0
Yes	2	18.2
No	5	45.5
Don't know	4	36.4
10b. If yes, What can be done?	2	100.0
Promote public awareness on the problem	1	50.0
Impose more restrictions on pesticide sale	1	50.0

Nearly all (94.4%) of the 124 GP members reported that mental health issues had never been a topic of discussion in local GP meetings. Some GP members reported that they had once attended a mental health workshop. Nearly all members expressed interest in the topic of mental health and its relevance

within their respective GPs. GP members indicated that DSH and suicide were common in the region. Almost all members (95.0%) reported knowing someone who had either attempted or committed suicide by consuming pesticides and 86.3% members said it was a problem in their village.

While 88.7% of members believed that the GP had a definite role in reducing pesticide-related DSH and suicide, 11.3% disagreed. Members suggested that the GP could play a more positive role in reducing the burden of DSH and suicide in the community by sensitising the public and their own GP members to the dangers of DSH and suicide with pesticide, intervening in family conflicts or disputes, and through active involvement in training and educating farmers about safe pesticide practice. Approximately 80.0% of the members believed that the GP should be empowered to regulate pesticide sale in the region, which was until then, outside the purview of their activities.

In the discussion following the completion of the questionnaire, when asked if DSH was considered to be a problem in the area a GP member said,

"I have noticed an increasing trend of suicides among unmarried youth. In my village, we have seen that children threaten their parents with suicide when the latter refuse to accept their choice of a life-partner and some of them actually go as far as killing themselves. Another common setting for suicide by pesticide poisoning by students is examination failure. I have noticed that throughout the year students pay little attention to academics and spend their time doing other things. Just before the exam they start studying and try to make up the backlog. But, that is not possible and many of them fail. And then, if their parents rebuke them for failing they go and consume poison. This is a new phenomenon that has been on the rise for the last few years. They are also learning from one another. Some student fails in the exams and tries to commit suicide after a scolding from parents for failing, and this influences other students to do the same."

GP members considered intentional pesticide ingestion to be a public health problem in Namkhana. Pesticides are most frequently used for attempting self-harm and are replacing the traditional methods like hanging and burning. Women were more prone to self-harm and dying as a result of it. Domestic violence characterised by extra-marital relations, alcoholism, physical and mental abuse were some of the major causes of self-harm identified by the GP members.

The members suggested that the GPs, along with the governmental health staffs, NGOs and women's organisations (Mahila Samity) have active roles to play in promoting public awareness on mental health and preventing self-harm in the community. The GPs should be empowered to intervene in matters of domestic violence, family conflicts and problems related to alcoholism. The

health committee under each GP should have working knowledge about common mental illnesses.

Table 5.3. Gram Panchayat (GP) members responses on pesticide practice and DSH

Questions	N	%
1. Has there ever been any discussion on mental health in your Gram Panchayat (GP)?	124	100.0
Yes	7	5.6
No	117	94.4
2. In your opinion do GP members need training in mental health?	124	100.0
Yes	123	99.2
No	1	0.8
3. Have you seen any mental patient in your community?	124	100.0
Yes	104	83.9
No	20	16.1
4. Are you aware of anyone in your locality who tried to kill herself/himself by consuming pesticide in the last one year?	124	100.0
Yes	117	94.4
No	7	5.6
5. Is self-harm by pesticide poisoning a problem in your community?	124	100.0
Yes	107	86.3
No	17	13.7
6. Does the GP have any role in reducing self-harm by pesticide ingestion?	124	100.0
Yes	110	88.7
No	14	11.3
7. If yes, what methods can be adopted to address the issue? (individuals mentioned multiple methods)	110	100.0
Awareness Generation among the public	82	74.6
Farmers' education and training	29	26.4
Restriction of pesticide sale	17	15.5
Family intervention during conflicts/ quarrels	15	13.6
Prevent violence against women	3	2.7
Socio-economic development	3	2.7
Women's emancipation	3	2.7
Literacy	2	1.8
Develop mental health services	2	1.8
Others	6	5.5
8. Do GPs have any role in pesticide sale?	124	100.0
Yes	99	79.8
No	25	20.2
9. If yes, what role can GPs play? (individuals mentioned multiple roles)	99	100.0
Impose rules on pesticide sale	65	65.7
Ban unlicensed pesticide shops	33	33.3
Farmers' education and training on pesticide use, storage	9	9.1
Generate awareness among the different sections of the public in Namkhana on pesticide use	9	9.1
Create a Special Pesticide Committee	2	2.0
Work with the agricultural department	1	1.0

On the basis of inputs, suggestion and requests few information, education and communication, IEC, materials were developed in Bengali for the farmers, pesticide shop owners and GP members and distributed among them. Feedback was also sought on the materials.

Table 5.4: IEC materials developed as the response to community participatory

IEC material- type	Name	Content	Target group
Booklet: An illustrated 12- paged coloured booklet with pictorial directives	An Appeal to Farmers – Be alert about use and storage of pesticides.	<ul style="list-style-type: none"> • Prevalence of unsafe pesticide practices in the local community. • Safe pesticide use and storage measures 	Farmers
Folder: A four paged coloured leaflet with written guidelines	Safety measures to be adopted while using pesticides	<ul style="list-style-type: none"> • Hazards of excess pesticide use • Precautions to be adopted while using and storing pesticides • Pesticide sale • First-Aid in case of pesticide poisoning-accidental, deliberate and occupational 	<ul style="list-style-type: none"> • Farmers • Pesticide shop-owners • GP members
Poster	Pesticide-cycle	Effects of pesticide on <ul style="list-style-type: none"> • Environment • Food • Health 	<ul style="list-style-type: none"> • Farmers • Pesticide shop-owners • Schools
Stickers: 10 brightly coloured assorted stickers and danglers		Slogans on <ul style="list-style-type: none"> • Safe pesticide use • Promotion of mental health 	Display in public places <ul style="list-style-type: none"> • Markets • Shops • GPs
Folder: A four-paged coloured folder with written information	Learn about mental illnesses- a resource for GP members and the general public	<ul style="list-style-type: none"> • Definition of Mental Health • Symptoms of common mental disorders 	<ul style="list-style-type: none"> • GP members • General public • Schools Teachers
Book on Mental Health: It contained detailed information on the six major mental disorders specified by	Awareness on mental health	<ul style="list-style-type: none"> • Mental illness and its global burden • Alcohol Addiction • DSH and Suicide 	Training material <ul style="list-style-type: none"> • GP members • Government health staffs (medics and

the World Health Organisation (WHO)		<ul style="list-style-type: none"> • Dementia • Depression • Epilepsy • Mental Retardation • Schizophrenia <p>Public and General Physician's role in promoting community awareness about mental health and mental illnesses</p>	<p>paramedics)</p> <ul style="list-style-type: none"> • Local health care providers (HCPs)
Booklet on DSH Prevention: A training material	Prevent Self-harm- Promote psycho-social intervention	DSH and suicide <ul style="list-style-type: none"> • Risk factors • Mental illnesses • Psychosocial stressors • Easy availability of means <p>Suggestions for community prevention</p>	General public including <ul style="list-style-type: none"> • Community workers • Farmers • Government health staffs • GP members • HCPs • NGOs • School Teachers • Women's groups (Mahila Samity)
Posters: Illustrations and slogans were selected from competition on self-harm prevention competition organised among school children of Namkhana		<ul style="list-style-type: none"> • Promote mental health • Prevent self-harm 	Display in Namkhana Island <ul style="list-style-type: none"> • All GPs • Schools • Prominent locations

Discussion

This participatory research for preventing pesticide-related self-harm highlighted five important issues: the role of FFGDs in participatory research, economic considerations and pesticide practice, the absence of regulation and supervision of pesticide sale, the lack of awareness about the hazards of incorrect and unsafe pesticide practice, and the importance of intersectoral community involvement in health promotion activities.

FFGDs

The FFGD was a very useful tool in facilitating the group discussions on the topic of pesticide related DSH and suicide in the Namkhana region. The procedure of distributing questionnaires prior to the main discussion provided advantages beyond typical FGD methods. First, it enabled the researcher to get quantitative data from different sections of the community within a short period of time. It provided access to a survey approximation from a sample of the community and it also motivated the discussion after focussing participants on the topic of the FGD agenda.

Economic considerations and pesticide practice

Namkhana is an agrarian region where majority of the people depend on agriculture for their living. Farmers extensively use and depend on pesticides to enhance crop production. They believe that using more pesticides would increase agricultural yield indicating lack of awareness about correct and safe pesticide practices. The pesticide shop owners respond and encourage this demand for pesticides which is instigated by aggressive marketing strategies of the pesticide companies. They exploit the situation, in selling pesticides without adequate precautions and interactions.³⁵ This unrestricted sale and unsafe pesticide practice not only leads to pesticide-related accidents, intentional and occupational exposures but raises serious ethical issues as well. This is a common feature in most agricultural communities of low-and middle-income countries.³⁶ This study showed the local agricultural department's lack of involvement in educating, supervising and monitoring farmers and pesticide shop-owners about correct and safe use of pesticides.

Absence of regulation and supervision of pesticide sale

Unregulated and indiscriminate pesticide sale and use flourishes on the Island. Apart from the regular pesticide shops, small grocery shops store pesticides too. Farmers prefer to have the product available to them at more accessible locations since transport and communication within the Island and outside is difficult. Hence, many grocery stores throughout the village cater to this demand of the farmers which benefits both the farmers as well as the grocery shop owners. Evidence of this dangerous trend has been reported from other rural communities in India.³⁷ The block agricultural department takes little interest in the activities of the pesticide shops. Furthermore, the GPs are not empowered to regulate or supervise pesticide sales and use. GP members have expressed their wishes that the GPs should be empowered to supervise and regularly monitor the activities of the

pesticide companies and pesticide shop-owners in Namkhana along with the agricultural department; impose regulations on the former and train the latter about the effects of pesticide use who would in turn be good resources of information to the farmers. Although the interest to regulate pesticide sale is a positive aspect, the pros and cons of this suggestion need to be carefully considered. It cannot be ascertained for sure if there would be an improvement in the prevailing situation on pesticide sale and use or an increase in corruption and nepotism and burgeoning of more illegal pesticide shops by bribing the administrative bodies.

Lack of knowledge about safe pesticide practice

The FFGDs indicated that the farmers involved in unsafe and risky behaviour with regard to pesticide practice mainly due to the lack of knowledge and information. They primarily relied on their personal experiences and had little exposure to training and information. This lack of knowledge also contributed to unsafe pesticide storage and taking unnecessary risks such as opening the bottle with their mouths or spraying pesticides without using any protective gears. Similar observations have also been reported from many low-income countries.³⁹⁻⁴¹

The pesticide shop-owners expressed their own lack of knowledge of information on the ill-effects of pesticide use. This brought about their inability to communicate the hazards of pesticide use to the farmers. Further, they had limited access to protective gears themselves and could not distribute it to the farmers freely.

It was reported that the agriculture department takes very little interest in. Farmers reported that the block agricultural department assigned an agricultural advisor for each GP, who is commonly referred to as KPS (*Krishi Prayukti Sahayak*) but he provided no assistance. The KPS is supposed to visit each village twice a month to inform farmers about newer methods of cultivation in order to increase crop production, answer their queries, promote safe pesticide practice, however, he is rarely seen. The farmers also stated that he agriculture department does not take any action against the KPS or provide any alternative solution.

Most GP members, themselves, are also crop cultivators and expressed the need for the GP to play a more active role in advising, training and educating the farmers about safe and more effective methods of agricultural practice. The members felt that they needed training from the agricultural department in order to be able to help themselves and all the other farmers of the region. Findings

from the FFGDs also suggest that although the GPs enjoyed a high degree of autonomy, nevertheless, they worked in isolation and had little interactions with the agriculture, health departments or the police.

Intersectoral community involvement and IEC

Research in recent years have indicated the positive contribution of local communities in determining health outcomes and increased responsiveness to public health priorities.^{42,43} A key feature of this integrated approach is the participation of the different sectors of the community to prevent health problems and promote public health.⁴⁴ This study emphasised the significance of and necessity to involve the different segments of the local community in addressing the issue of intentional self-harm in general^{26, 45–48} and with pesticides in particular on the Namkhana Island of the Sundarban region, India.

Increased community participation can be ensured through information, education, communication (IEC). The present research also highlighted the importance of IEC in dissemination of public health-related information. The IEC materials were designed by incorporating the local community's suggestions and views and these resources were very useful in generating public awareness, training as well as in sharing information with the local community about the broader contexts of mental health including accidental, intentional and occupational pesticide exposure. The resources were culture conducive and the local community identified with and accepted them on most occasions since they had a role to play in their development. However, in some cases, particularly the farmer's group commented about not knowing some fruits and trees in the picture and indicated regional plants and fruits be included in future. This study underscored the importance of intersectoral community participation and IEC in promoting mental health and generating awareness about the problem of self-harm in general and with pesticides in particular.

Limitation

The integrated approach involving different sections of the community in preventing self-harm was adopted by this study. However, certain shortcomings are recognised. The participatory activities were limited by resources including time to guarantee sustained effort. Nevertheless, the present attempt was effective in involving the local community in efforts to promote mental health and prevent self-harm, mainly with pesticides.

Conclusion

The issue of DSH is not only a medical or health related problem resulting from a single factor, but, the interaction of a host of factors. This report focuses on the access to pesticides as a contributing factor. Psycho-social stressors such as torture on women, domestic violence, alcoholic and abusive husbands, easy availability of means of self-harm, inaccessibility to suitable health-care, lack of social support systems all interplay to trigger self-harm attempt in people of Namkhana.

Findings identify related interests of DSH and suicide, agriculture and pesticide use that are relevant for a universal DSH and suicide prevention strategies. This involves intersectoral liaison between the agricultural, health departments, the police and the community to effectively reduce morbidity and mortality from pesticide-related DSH and suicide in the Namkhana block of the Sundarban region, India.

The active involvement of the agriculture department in conjunction with the GPs to promote safe pesticide practice, train farmers in alternative methods of pesticide use, such as Integrated Pest Management (IPM), generating awareness to purchase limited quantities of pesticide, only the required amount; promoting awareness of the negative as well as positive effects of pesticides on crops, health and environment; regulating and supervising sale of pesticides in the region, may help to reduce the magnitude of the problem. The GP members had shown interest in mental health issues and were conducive to receiving training in mental health and showed willingness to take up mental health issues as a part of their activities and this should be encouraged. The GP may contribute positively in sensitising the community about the typical settings in which DSH and suicide occur and encourage the community to support individuals at risk.

There is a need to integrate mental health and general health in Namkhana and the Sundarban region. The health department's role in generating awareness about mental health and other general disorders which may result in a suicide attempt, improving treatment of self-harm patients may also help in reducing the burden of DSH and suicide in the community.

The community component should strengthen family supports, focus on social justice to reduce disadvantages of gender roles and support restriction of dangerous means which pose as risks to healthy life. The psychosocial dynamics and situational stressors leading to intentional self-harm can be addressed by family interventions, establishment of social justice and by limiting access to methods of DSH. Addressing the typical situational stressors and mobilising the community supports to assist those vulnerable to DSH and suicide constitute an important approach for reducing morbidity

and mortality from self-harm.

The effectiveness by collaborating with the different sectors of the community in preventing self-harm and promoting mental health are being emphasised by suicidologists.⁴⁵⁻⁴⁸ Community participation helps to support public health goals and unfolds new social information that would help policy and strategy planning.⁴⁹ Community involvement helps to implement improved mental health care at the community level and thus help to reduce self-harm incidents.⁵⁰ Stengel (1964)⁵¹ made one of the earliest attempts to show that efforts to control the environment may impact upon the decreasing the incidence of suicides. De Leo and Spathonis (2005)⁵² drew attention to the importance of dissemination of information through education, participation and training of the different sectors of the community in the community-based suicide prevention programme and this research approach fulfils these aims in many ways.

This study showed the need for an intersectoral approach involving the different segments of the population to promote public health and prevent DSH and suicide particularly with pesticides.

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Chapter 6

Discussion and conclusion

Discussion and Conclusion

This study has made one of the earliest attempts to integrate a programme of self-harm prevention and community mental health in the Sundarban region, West Bengal as well as in rural India. In the late 1990s a study was conducted in the Sundarban region to assess the feasibility of developing sustainable community mental health services which, the region lacked (Chowdhury *et al.*, 1999). During the course of this research various segments of the local community expressed concerns about non-fatal deliberate self-harm (DSH) and suicide, emphasising the role of intentional pesticide ingestion and requested the research team to address the issue (Chowdhury *et al.*, 2003; Chowdhury *et al.*, 2004b). Responding to these needs, a study on DSH and suicide prevention were included in a community mental health programme in the Namkhana Island of the Sundarban region involving research, clinical services and community interventions.

Based on the findings of the study, the aim of this thesis was to explain the problem of DSH and suicide in the Sundarban region in general, focussing on Namkhana Island and to consider ways by which a community mental health programme may respond. To develop a comprehensive understanding of the problem, several studies were undertaken. Methodologically, this research adopted certain aspects of the Public Health Approach to suicide prevention (Mrazek & Haggerty, 1994; Potter *et al.*, 1995; Litts *et al.*, 1999; Hammond, 2001) and has used a combination of methods - clinical and cultural epidemiology along with intersectoral community participation to address the issue.

In this thesis the four methods are described as follows:

A retrospective study (1999-2001) was carried out in six island hospitals to clarify the epidemiology of the problem, based on patients coming to clinical attention. This study examined the clinical epidemiology, including case fatality rates (CFR) and determinants of self-harm in 6 island blocks of the region. Clinical records of DSH from 1999-2001 were examined for 1,277 DSH patients admitted to the six island-hospitals (chapter two).

A cultural epidemiological study was carried out among 40 DSH patients admitted to a hospital in Namkhana to clarify patients' accounts of their reasons for self-harm with reference to triggers, underlying problems of their DSH event, perceived causes of these problems and help-seeking behaviour for these underlying problems prior to the DSH attempt (chapter three).

To explain patterns and the role of pesticides in DSH in the community, a cross-sectional survey

was carried out in 1,680 households of 21 villages on Namkhana Island. This study assessed household reports of agricultural and pesticide practice- the level of awareness among farmers about the safety, storage and ill effects of pesticide use. It also examined the use of pesticides and other methods along with reasons for suicidal behaviour and accidental poisoning in the community (chapter four).

A community participatory research and action agenda was also implemented to identify community perceptions about the typical contexts in which self-harm occur (chapter five). This thesis studied and worked in partnerships with farmers, pesticide shop-owners and local governing bodies (gram panchayat, GP) members. These three groups were selected because farmers and pesticide shop owners deal directly with pesticides and GPs are the most powerful political organisation in the villages. The opinions, risk perception and suggestions of these three groups shaped interventions for preventing DSH and suicide, particularly with pesticides, in the context of a community mental health programme implemented with the support from the Institute of Psychiatry, Kolkata, India. Findings from the study of selected important interest groups in the community for interventions to prevent DSH and suicide in general and with pesticides in particular guided this study.

Limitations and achievements of the research

The clinical epidemiological findings of chapter two indicate that women were particularly vulnerable to suicides. It reiterated community perceptions that pesticides were the most frequently used method for self-harm coming to medical attention. Similar to findings from other studies in low- and middle-income countries case fatality rates (CFR) of pesticide-related DSH were also found to be high (Hettiarachchi & Kodithuwakku, 1989a&b; Eddleston *et al.*, 1998; Eddleston, 2000; Roberts *et al.*, 2003; van der Hoek & Konradsen, 2005; Srinivas Rao *et al.*, 2005) showing potential for preventing mortality from both accidental and intentional poisoning.

Limitation of this study mainly resulted from poor data recording in the six island-hospitals and a lack of disciplined data management. This pitfall in data recording highlighted the need to develop uniform guidelines of data management and the need for ongoing surveillance. To address this problem, a 'self-harm register' was designed to record both quantitative and qualitative data on demographic information of patients and narrative accounts of the patient-reported problems leading to DSH. These registers have been distributed in all the Sundarban Block Primary Health Centres (BPHCs) to establish a uniform DSH surveillance system in the region to monitor and provide better insight into the epidemiology of the problem including risk factors and thereby guide policy and planning to prevent

DSH and suicide.

Despite its limitations, this study was the first attempt to document the problem of DSH and suicide coming to medical attention in the six islands of the Sundarban region. It clarified the problems confronting existing health services and suggested measures to deal with them. Improving access to treatment of DSH patients, developing uniform guidelines for the management of pesticide poisoning cases, training the medical staff, making cheap and effective antidotes easily available in the community will all decrease the CFRs due to pesticide poisoning in the region. Moreover, the study highlighted the need for the agricultural department's involvement in training farmers and supporting campaigns promoting safe pesticide practices throughout the region, which is a priority they must acknowledge and respond more diligently.

The Cultural epidemiological study in chapter three clarified the contexts and themes that led to DSH among 40 self-harm patients admitted to the Dwariknagar BPHC of the Namkhana Island. This study identified the psychosocial and cultural stressors patients associated with DSH attempts. Narratives emphasised interpersonal conflict, particularly with spouse and in-laws, as the most frequent reason given for DSH. Domestic violence, particularly against women and the easy availability of pesticides were frequently reported as causes of DSH.

Although this study is one of its kind in the Dwariknagar BPHC of the Sundarban region, certain weaknesses are acknowledged. This data set lacked a psychiatric assessment, which would help to classify the interrelationships of psychopathology, and situational and cultural stressors. Such data would contribute both to suicide prevention strategies and to broader interests of community mental health. This study was limited by the small sample size of the study population, which makes it difficult to generalise these findings to the community at large.

The strengths of this study is that it examined the role of cultural values in the context of interpersonal relations and psychosocial stressors (Bhatia *et al.*, 1987; Zhang *et al.*, 2000; Gururaj & Isaac, 2001; Phillips *et al.*, 2002; Girdhar *et al.*, 2004; Banerjee & Sauerborn, 2006; Parkar *et al.*, 2006) which have been widely acknowledged in popular literature, but remain largely neglected in professional research. It also studied patients' perspectives of the problem which continue to receive little attention in suicide research (Bridge, 2006; Flanagan, 2007). Including patients' perceptions of the problem offer practical benefits to self-harm prevention programmes.

The methods of cultural epidemiology indicate an approach that enables professional research to address locally perceived needs that help to define policy strategy for a community based mental health programme in rural areas.

Chapter four, the household survey, showed the practical problems that farmers face, such as lack of proper information on hazards involved in pesticide use, safety measures to be adopted, lack of pesticide storage space, financial constraints, involvement of family members in cultivation without adhering to guidelines of safe pesticide practice as enumerated by national and international organisations. The easy availability of these chemical substances in moments of distress makes it the most frequently used method for self-harm (Gunnell & Eddleston, 2003; Eddleston & Phillips, 2004, Konradsen *et al.*, 2005).

Similar to findings from the clinical retrospective and cultural epidemiological study, this study also found that women were particularly vulnerable to self-harm and the typical reasons for DSH and suicide were interpersonal conflicts. The household survey indicated high rates and female preponderance of DSH and suicide, consistent with high rates in South India (Joseph *et al.*, 2003; Aaron *et al.*, 2004). This study further contributed to the general body of suicide research insofar as it not only considered suicide rates but also DSH rates.

The findings of this study also addressed certain limitations. The rates of suicidal behaviour have to be interpreted taking into account that the recall period of DSH and suicide was five years. It was not possible to cross check the information on suicidal behaviour provided at the household level. However, this limitation will continue to exist in view of the socio-economic and educational background of the population.

Establishing a rate, however, was not the objective of this study; our finding indicates a need for that. To accomplish that, ongoing surveillance in the population, rather than a survey of a relatively small sample for this rare event is required. In that regard, studies should be monitored by health demographic surveillance systems and using verbal autopsies (Joseph *et al.*, 2003).

The interpretation pertaining to storage of pesticides by the respondent was subjective which lead to a difference with regard to the assessment by the interviewer. As a result the extent of agreement, which was also calculated, was poor. The assessment was nevertheless based on recommendations for safe storage, and it was usually clear, rather than ambiguous, lending validity

to the findings.

Most of the available data on DSH and suicide with pesticides continues to be based on clinical findings (London *et al.*, 2005). Globally, it has been acknowledged that hospital-based data underestimates the problem for a number of reasons. Not all cases of pesticide-related DSH come to medical attention because of limited access to treatment, economic considerations, distance from the health centres, problems of transportation and seriousness of the attempt leading to rapid death (Keifer *et al.*, 1996). Gender and social stigma also influence medical help seeking. Clinic-based data tell only part of the story; they typically summarise demographic features of cases, and sometimes psychiatric and medical risk factors. With these factors in mind, the household survey was undertaken in 1,680 households in Namkhana block of the Sundarban region. The household survey on DSH and suicides provided a novel approach to suicide research, relevant for prevention by examining the contexts, motivations, or opportunity-related risk factors for DSH and suicides, particularly with pesticides which clinical data sets lack.

Chapter five highlighted the importance of and necessity to involve the different segments of the local community in addressing the issue intentional of self-harm (US Dept. of Health & Human Services, 1999; Bertolote, 2004; Soubrier, 2004; Wells *et al.*, 2004) in general and with pesticides in particular on the Namkhana Island of the Sundarban region, India.

This study acknowledges certain shortcomings. The participatory activities were limited by resources to guarantee a sustained effort as a result the impact of the community participatory research on preventing self-harm in general and with pesticides in particular could not be assessed.

This programme was based on the Operational Model (OM) (Gordon, 1983) that concentrates on intervention rather than on causality or etiology and suggests three types of intervention to prevent suicidal behaviour viz., universal, selective and indicated approaches. This research adopted the relatively less implemented universal approach. This approach as proposed by the OM focuses more on community involvement for suicide prevention programmes and is being recommended by experts in the field. The power-sharing (Israel *et al.*, 1995) and focus on community action (Rains & Ray, 1995) in the research process was the forte of the study.

This study developed a new tool - the facilitated focus group discussions (FFGDs), a modification of the traditional focus group discussion (FGD). Discussions in any meeting were facilitated by introducing the topic with a group-specific questionnaire that participants were asked to complete,

helping to focus their attention on the topic at the onset.

The present study also highlighted the contribution of information, education, communication (IEC) in dissemination of public health-related information. Since all IEC materials were designed by incorporating the local community's suggestions and views, on most occasions they were appreciated. However, in some cases, particularly the farmer's group about not knowing some fruits and trees in one of the pamphlets and requested more regional plants and fruits be included in future. These IEC resources were very useful in generating public awareness, training as well as sharing information with the local community on Namkhana Island about mental health, the problem of self-harm in general and with pesticides in particular.

Implications of the findings

Findings of this study were contrary to those in industrialised countries, but conform to studies conducted in other low-and middle-income agrarian countries, from other parts of India and previous studies in this region. While the most commonly used method of self-harm in industrialised countries are prescribed drugs (Gunnell *et al.*, 2000; Gunnell *et al.*, 2004;) and firearms (Miller *et al.*, 2002), pesticides are the method of choice for DSH and suicide in agrarian societies of low-and middle-income countries the (Moghadamnia & Abdollahi, 2002; Phillips *et al.*, 2002; Gunnell & Eddleston, 2003; Kalkan *et al.*, 2003; Nesime *et al.*, 2004; Thanh *et al.*, 2005). Studies from different parts of India (Gautami *et al.*, 2001; Batra, 2003) and previous research in the Sundarban region (Dalal, 2002; Chowdhury *et al.*, 2003; Chowdhury *et al.*, 2004a) have also indicated the widespread use pesticides in self-harm. Limiting access to these deadly agents may save precious lives.

The CFR of DSH in the study health-centres was higher than in most industrialised countries, which are typically less than 1.0% (Gunnell *et al.*, 2004). The CFR for poisoning is typically much higher than 10.0%, in low-and middle-income countries (Eddleston, 2000; Hettiarachchi & Kodithuwakku, 1989a&b; Gunnell & Eddleston, 2003). It is not the quality of clinical care, but also the particular agents used in self-harm that accounts for differences in mortality. The substances consumed in overdose in high-income settings are typically prescribed or non-prescription drugs that are less toxic than lethal pesticides. Other factors, such as proximity to the health centre, lack of drugs, availability of antidotes (Eddleston *et al.*, 1998) and an absence of uniform management guidelines to treat self-harm patients also contribute to the higher CFRs.

High CFRs indicate the need to improve case management in the health centres. Both, clinical training and resources to make use of clinical skills are needed. Establishing guidelines to manage self-harm patients, training medical personnel, and ensuring the availability of cheap antidotes in households and health-centres are appropriate measures that will reduce pesticide mortality.

The general trend of self-harm in high-income countries is that more women attempt self-harm (Platt, *et al.*, 1992; O'Loughlin & Sherwood, 2005) and more men die by suicide; suicide rates are two to three times higher for men than women (Cantor, 2000). This may have some relation to the fact that the disadvantage of female gender roles contributes to the vulnerability of women in low- and middle-income countries, particularly young married women which account for differences in mortality. Moreover, pesticide use for self-harm may be a factor that increases the risk of female to male suicides, an assertion supported by studies from China (Phillips *et al.*, 2002) and southern India (Aaron *et al.*, 2004). Further study of this hypothesis is required.

In Western settings, the importance of psychiatric risk factors are highlighted in DSH and suicide studies, whereas self-harm research in Asian countries emphasise the role of sociocultural values along with emotional and situational stressors in DSH and suicide. Results from this study identified situational and cultural stressors patients associated with their DSH attempts, indicating their relevance in Indian and other Asian communities. Similar findings have been expressed in studies by Bhatia *et al.*, (1987); Girdhar *et al.*, (2004); Konradsen *et al.*, (2006); Parkar *et al.*, (2006).

Socio-cultural stressors of suicidal behaviour as perceived by patients are widely represented in popular literature but receive little attention in academic research and prevention programmes. Current research on suicide prevention continues to be guided by epidemiological, psychiatric, sociological studies which reflect professional perspectives. In his article, Knox and colleagues (2004) are of the opinion that suicide prevention programmes which combine both the professional as well as patient perspectives is more likely to reduce suicide rates. Findings from this study suggest particular situational and cultural stressors that constitute risk factors, which should be considered in formulating strategies for DSH and suicide prevention.

Self-harm is a public health problem, prevention of which requires an integrated and multilayered population based approach. The Public Health Approach to suicide prevention follows from a public health model of disease prevention that emphasises health promotion that combines health education and environmental support with an emphasis on the community's influence on health

(Mrazek & Haggerty, 1994). This study underscored the importance of community participation and involvement in making a programme of self-harm prevention a success.

Agriculture is the main occupation of majority of people of Namkhana and pesticides are extensively used in cultivation. Hence, any preventive measure to reduce accidental, intentional or occupational pesticide poisoning must be practical and tailored to the needs of the local community, which can only be achieved by widespread community involvement. Community participation in modification of any health-related behaviour has been suggested by a number of studies (Siwach & Gupta, 1995; Leveridge, 1998; Kalkan *et al.*, 2003). Though the present attempt was limited by time and resources to guarantee sustained effort, yet it was very effective in drawing the public attention and support in the self-harm prevention efforts of the research team.

Conclusion

This study shows that DSH and suicide typically results not from a single factor but from an interaction of situational stressors and the easy access to lethal pesticides. This finding has implications on policy and planning. In order to reduce premature morbidity and mortality due to DSH and suicide from intentional pesticide poisoning, all of these factors need to be addressed through an intersectoral approach involving the administration, the agriculture department, the health sector and the community at large (Konradsen *et al.*, 2005; Mann, *et al.*, 2005; Chowdhury *et al.*, 2007).

Administrative agencies have an important role to play in regulating and supervising the sale of pesticides, coordinating with the agricultural department its various activities and ensuring the personnel in the agricultural department performs his regular duties and in encouraging supports to those vulnerable to indulging in suicidal behaviour.

The role of the agricultural department would include promotion of safe pesticide practice, train farmers in alternatives method of pesticide use such as Integrated Pest Management (IPM), generating awareness to purchase limited quantities of pesticide- the required amount only and improve storage facilities, promoting awareness about the positive as well as negative impacts of pesticide use on crops, health and environment regulating and supervising sale of pesticides in the region, encouraging farmers to visit health centres in case of occupational exposure.

The health department should contribute to reducing the morbidity and mortality of pesticide poisoning—whether accidental and intentional—by making cheap antidotes available in the community,

both at the health centres and in households, establishing guidelines to manage self-harm patients, improving treatment, training medical and para-medical personnel (especially community health staff), developing a regular poisoning surveillance system, health education on poisoning among the local community members. Preventing suicide and managing suicidal behaviour also requires sensitising the public to questions about recognising mental illness, which constitutes an important component of suicide prevention, and to recognise the typical socio-cultural contexts in which pesticides are consumed (Chowdhury & Weiss, 2004). This study also recognises mental health needs include, but go beyond, psychiatry. In order to develop an effective DSH and suicide prevention programme, both professional and patient perspectives should be taken into consideration (Flanagan *et al.*, 2007) supported by community and clinical studies.

The community should strengthen family supports, focus on social justice to reduce disadvantage of gender roles and support restriction of means of self-harm. The psychosocial dynamics leading to self-harm can be addressed by family interventions. Community supports and awareness of risks of self-harm and mental health interests need to combine the community and clinical focus of mental health interventions. Addressing psychosocial stressors, situational contexts and mobilising the community to assist those vulnerable to DSH and suicide constitute an important approach for reducing morbidity and mortality from self-harm.

This area-specific study demonstrates the importance of an integrated approach for more effective DSH and suicide prevention strategies for broader application in India and settings elsewhere where pesticide-related DSH and suicide are important public health problems.

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Academic qualifications

1. **PhD: 2001- 2005 (July)** in Epidemiology from University of Basel. Worked at Swiss Tropical Institute, Switzerland. Thesis: 'Pesticide poisoning, deliberate self-harm and suicide in the Sundarban region of West Bengal, India.
2. **Diploma in Child Education & Health: 1999 (April-July):** Hertford Regional College, Essex, U.K.
3. **Master of Arts (MA): 1995-1997:** International Relations. Jadavpur University, Calcutta.
4. **Bachelor of Arts (BA): 1992-1995:** Political Science. Jadavpur University Calcutta.

Work Experience

1. **February 2006 - till date:** Service Area Centre Coordinator of an NGO- SAHAY (affiliated to Children International- CI, Kansas City, USA) which works towards improving the quality of life of underprivileged children living in slums of North Calcutta by providing them with educational, nutritional, health and overall developmental facilities. Responsibilities include overall daily administration and coordination of activities at the Service Area Centre (SAC).
2. **November 2001-September 2003:** Research Coordinator in a World Bank funded Deliberate Self-harm Prevention Programme in the Sundarban Region, West Bengal, India under Institute of Psychiatry, Calcutta. **3.September 1999-October 2001:** Research Assistant in a Community Psychiatry Project in the Sundarban Region, West Bengal, India, jointly sponsored by the Institute of Psychiatry, Calcutta and the Swiss Tropical Institute, Basel, Switzerland.
4. **July 1998-March 1999:** Resource Generation Executive in CRY (Child Relief & You) a premier NGO dedicated to the cause of child welfare in India. Responsible for fund raising including selling CRY-made greetings cards and calendars and various other stationery products.

Workshops and conferences

1. Poster presentation entitled 'Clarifying the local burden and context to prevent deliberate self-harm in the Sundarban region, India at the Global Forum for Health Research, Mumbai: 12-17 September, 2005.
2. Attended and organised National workshop on 'Suicide Prevention at Primary Care' at Calcutta, India: 15-16 January, 2004.
3. Poster presentation entitled 'Suicide prevention in the Sundarban region of West Bengal, India' at the 3rd Aeschi conference, Switzerland: 3-6 March, 2004.
4. Paper Presentation on 'Deliberate self-harm and suicide in the Sundarban region: the role of pesticides' at the 10th European Symposium on Suicide and Suicidal Behaviour at Copenhagen: 25-28 August, 2004.
5. Paper Presentation on 'Suicide prevention in the Sundarban region of West Bengal, India: community action' at World Health Organisation (WHO), Geneva, Switzerland: 10 September, 2004.
6. Paper Presentation on 'Focus Group.Discussion in the prevention of deliberate self-harm' at the International Conference on Mental Health, Colombo, Sri Lanka: 3-5 April, 2002.
7. Attended and organised International workshop on 'Mental Health Education and Service Development' at Calcutta, India: 7-8 February, 2000.

Academic courses attended

1. Attended 'Cultural Epidemiological Workshop for Infectious Diseases': Swiss Tropical Institute, Basel, 22-27 July, 2002.
2. Attended workshop on 'Counselling Techniques' organised by Indian Society of Health Administrators (ISHA), Bangalore: 19-

23 March, 2001.

3. Attended Workshop on Urban Health: Swiss Tropical Institute, Basel, Switzerland: 1-7 July, 2001.

4. Attended the 20th European Course on Tropical Epidemiology: Swiss Tropical Institute, Basel: 3 -14 September, 2001.

Publications

1. Pesticide practices and suicide among farmers of the Sundarban region in India Chowdhury, A.N., Banerjee, S., Brahma, A. & Weiss, M. G. Food and Nutrition Bulletin, 2007 28 (2), S381-S391.
2. Childhood Accidental Poisoning in Sundarban Delta, India. Chowdhury, A.N., Banerjee, S., Brahma, A. and Biswas, M.K. Indian Journal of Public Health, 2007 (in press).
3. Cultural dimensions of suicidal behaviour in the Sundarban region, India, and Basel, Switzerland. Banerjee, S. & Sauerborn, C. Bulletin von Medicus Mundi, Schweiz, 2006 vol 100.
4. Household survey of suicidal behaviour in a coastal village of Sundarban region, India Chowdhury, A.N., Banerjee, S., Das, S. et al., International Medical Journal, 2005 12: 275-282.
5. Psychiatric morbidity at primary care: study from a community mental health clinic at Sundarban, India: Chowdhury, A.N., Brahma, A., Banerjee, S., & Biswas, M.K. International Medical Journal, 2005, 12: 11-18.
6. How to operationalise community mental health service at primary care? Experience of IRMC model from Sundarban, India: Chowdhury, A.N., Brahma, A., & Banerjee, S. International Medical Journal, 2004, 11:105-110.
7. Ecopsychology of deliberate self-harm: a pilot study from rural West Bengal: Chowdhury, A.N., Banerjee, S., Chakraborty, A.K., & Weiss, M.G. Eastern Journal of Psychiatry, 2004, 8:22-27.
8. Interrater Reliability of the EMIC in a pilot study in West Bengal: Chowdhury, A.N., Sanyal D., Bhattacharya, A., Dutta, S.K., Banerjee S., et al., International Medical Journal, 2001, 8: 25-29.
9. Prominence of symptoms and level of stigma among depressed patients in Calcutta: Chowdhury, A.N., Sanyal, D., Bhattacharya, A., Dutta, S.K., De, R., Banerjee, S., et al., Journal of Indian Medical Association, 2001, 99: 22-23.
10. Pesticides And Suicide Epidemic Among Indian Farmers: A Grave Public Health Challenge: Chowdhury, A.N. & Banerjee S. Indian Journal of Social Psychiatry, 2001, 17:62-69.
11. Stigma and Mental Illness: Pilot study of laypersons and Health Care Providers with EMIC in Rural West Bengal, India: Chowdhury A.N., Sanyal D., Dutta S.K., Banerjee S., et al., International Medical Journal, 2000, 7: 25 7-260.
13. Communication: An Organizational Skill: Banerjee S. Industrial Psychiatry Journal, 2000, 10:24-27.

Merit Activities

1. Recipient of *Leelabati-Bholanath Award*, Zonal Branch, Indian Psychiatric Society, for the paper entitled *Psychiatric Morbidity at Primary Care- Study from a Community Mental Clinic at Sundarban, India: 2004*
2. Recipient of *Siddhartha Memorial Award*, Eastern Zonal Branch, Indian Psychiatric Society, for the paper 'How to operationalise community mental health service at primary care – Experience of IRMC model from Sundarban': 2003
3. Recipient of Women's Council (U.K.) Scholarship for the study of Diploma in Education and Health: 1999.

Computer skills

Microsoft Word, Excel, PowerPoint, Stata, Internet, Corel draw, Epi-Info, Free hand and MAX qda

Languages

Bengali (fluent), English (fluent), German (advanced), Hindi (fluent)